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AMERICAN
DYESTUFF REPORTER

DEVOTED TO THE INTERESTS OF TEXTILE CHEMISTRY
• BLEACHING • DYEING • FINISHING • PRINTING •
AND THE NECESSARY MECHANICAL EQUIPMENT

"Circulated Everywhere Textiles Are Processed"

VOLUME XXV | APRIL 20, 1936 | NUMBER 8

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Official Publication of the American Association of Textile Chemists and Colorists

THE OBJECTS OF THIS ASSOCIATION ARE:

"To promote increase of knowledge of the application of dyes and chemicals in the Textile Industry.

"To encourage in any practicable ways research work on chemical processes and materials of importance to the Textile Industry.

"To establish for the members channels by which the interchange of professional knowledge among them may be increased."

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AMERICAN
DYESTUFF REPORTER

VOLUME XXV APRIL 20, 1936 NUMBER 8

Personnel and Machinery Layout of a

Knit Goods Dyehouse

IN the modern dyehouse, whether concerned with knit goods or woven goods, two things are of utmost importance to the efficient production of the work at hand; one is the proper distribution of labor among the personnel of the dyehouse and the other is the proper selection and placement of equipment. Concerning the personnel, the activities of the modern dyehouse are generally assigned to the control of specialists who are responsible to a high grade executive—the superintendent of dyeing. This will generally prove most satisfactory (except in the case of a very small dyehouse) as there are too many details of production and labor to permit their adequate execution by one individual. The dyehouse superintendent of today is technically trained and has had sufficient practical experience to enable production to proceed with profit. As far as dyeing machinery and other equipment is concerned it must be selected for the efficient and economical handling of one particular firm's production. Next in importance to the selection of the very best machinery available is the proper placement of the correct size and number of machines. The location of machinery will vary of course for each individual dyehouse and if you are of the opinion that your dyehouse is not properly laid out so as to provide maximum efficiency you can undoubtedly rearrange your grouping so that it will prove more satisfactory. If you are unable to solve this problem yourself, call in the representative of the company from which you purchased your machinery and he will undoubtedly be able to help you. An inefficient, poorly planned line-up of machinery, although more than adequate to handle all your production, can be a greater handicap than a slight lack of capacity and many more times wasteful.

This article will deal with the problems mentioned above as applied to a knit goods dyehouse and for purposes of illustration the dyehouses of a well known knit goods producer have been chosen. Two particular units of this company have been selected; one because hosiery, knit piece goods and yarn are handled in a single dyehouse and the other because hosiery is handled exclusively. These two units are the Brooklyn, N. Y. and Bangor, Me. dyehouses of Julius Kayser & Co. Other dyehouses are located in Sherbrooke, Canada and Australia. All of the separate units are under the control of one superintendent of dyeing. The Brooklyn branch handles knit goods generally, including hosiery and the Bangor branch is concerned with hosiery dyeing only. The personnel will be discussed generally; equipment layout will be discussed specifically for the two individual dyehouses.

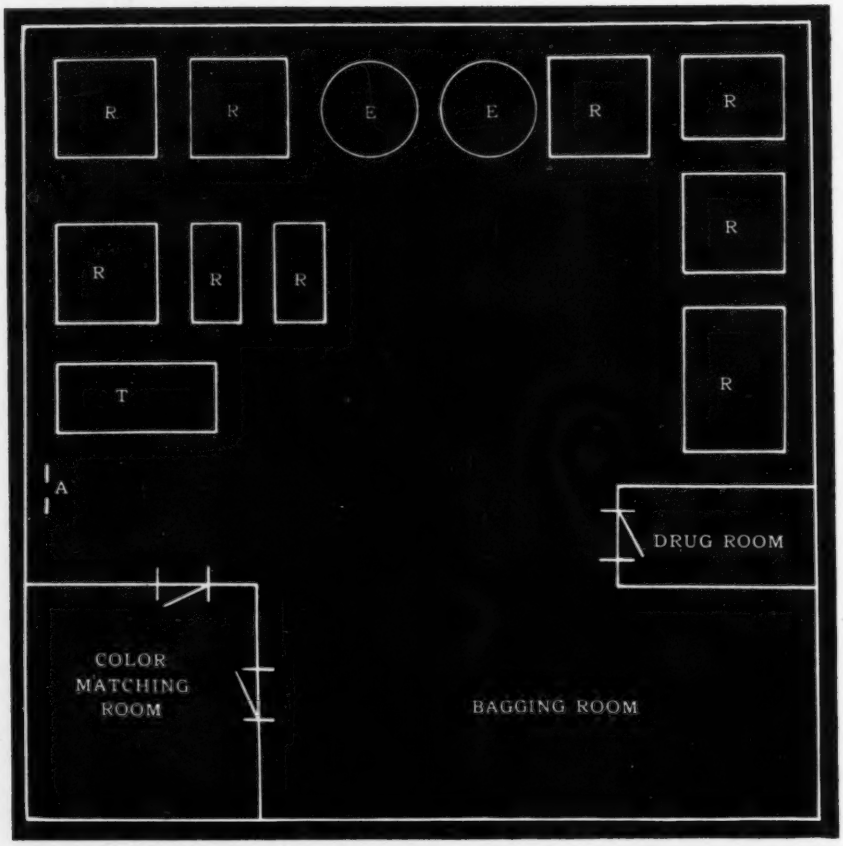
PERSONNEL

A technically trained superintendent is in charge of dyeing operations. There are in addition, at each dyehouse, one or more dyers to handle the production. For example at the Brooklyn branch, there is one dyer handling hosiery and another handling piece goods. Other duties are assigned in accordance with the individual qualifications of the various employees:—matchers, floor men, drug men and machine operators. The following illustrates the various steps during which a shade is developed and carried through to production in this particular company: (1) a group of shades is designated for samples by the sales office; (2) shades are matched at the Brooklyn branch (headquarters of the superintendent of dyeing); (3) samples are dyed up; (4) samples and formulae are then furnished to all branches and (5) samples can be put on a production basis when and if desired.

EQUIPMENT

Brooklyn Branch

As far as equipment is concerned we naturally find the building in which the dyehouse is contained of considerable importance. In some cases the dyehouse may be built to certain predetermined specifications embodying everything that the dyer considers of value; in other cases it is necessary to adapt existing facilities to the individual requirements. The latter was the problem which presented itself in this particular dyehouse which had formerly been used for a weave shed. This in itself, however, presented



MACHINERY LAYOUT OF BANGOR PLANT

KEY TO ILLUSTRATIONS

R—Rotary Dyeing Machines for Hosiery.

P—Piece Dyeing Machines.

S—Skein Dyeing Machines.

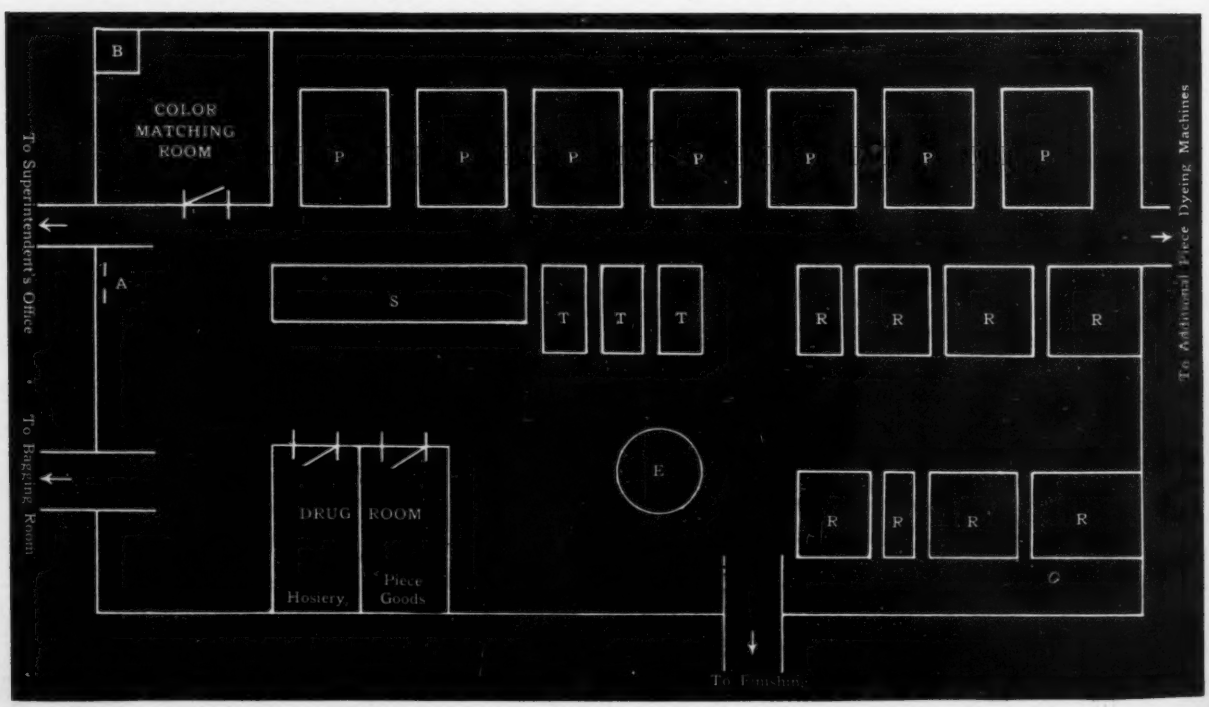
T—Tanks.

E—Extractors

B—Color Matching Booth.

A—Sample Dryers.

BELOW—MACHINERY LAYOUT OF BROOKLYN PLANT

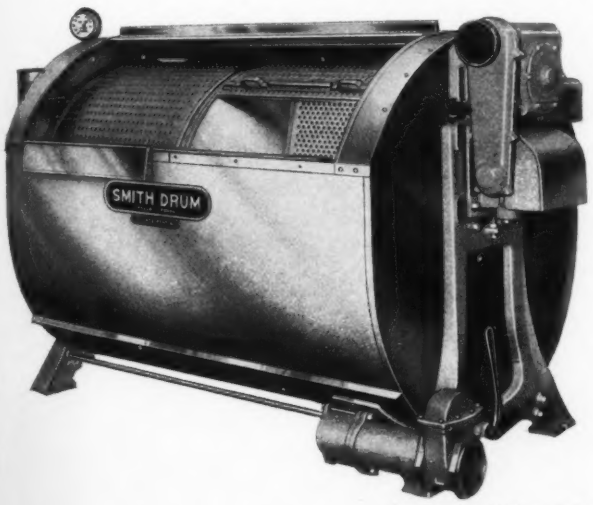


certain advantages which were utilized in planning the dyehouse. It is a one story building with skylights which furnish ample light for daytime operations. After the mechanical difficulties of providing a water supply and steam supply had been taken care of the machinery was laid out as shown in the accompanying sketch.

The hosiery dyeing machinery is of the rotary type constructed of Monel metal and varies in size from a 10 pound unit to a 250 pound unit. The accompanying illustrations indicate the type of machine installed. The dyeing machinery for the knit piece goods is of the usual oval reel dye beck type. Machinery of this type is also illustrated. There are a number of skein dyeing machines constructed of Monel metal and fitted with Pyrex covered reels. Two skein dyeing machines of different manufacture are shown in the accompanying illustrations. An extractor of the usual type completes the mechanical equipment of the dyehouse proper. Two types of extractors are illustrated on the following page.

Courtesy, Rochester Engineering & Centrifugal Corp.

Rotary Dyeing Machine



Courtesy, Smith Drum & Co.

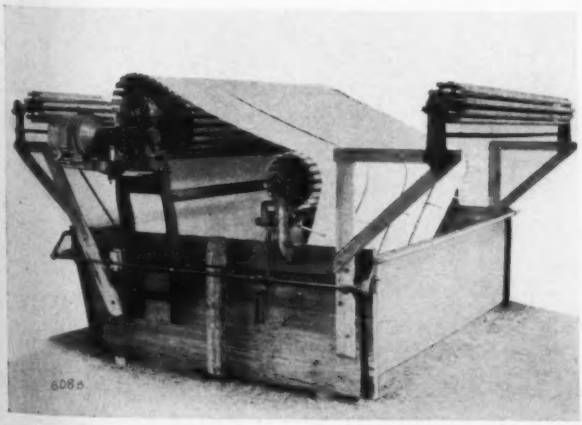
Rotary Dyeing Machine

The color matching room occupies a corner of the dyehouse and is adequately lighted by a north sky reflection, which, as far as natural lighting sources are concerned is generally considered ideal. In addition an artificial daylight lamp combined with an ordinary artificial lamp, for comparative purposes, is enclosed in a booth with non-reflecting side walls. A lamp of this type is shown in the illustration. A file of master formulae which have been standardized on a production basis is kept in the matching room and is supplemented by swatches of material. Duplicates are provided for use in the branch dyehouses.

Another corner of the dyehouse is occupied by the drug room. In this particular dyehouse it is divided into two portions—one containing the dyes for piece goods and the other containing the hosiery dyes. It should be noted that the volume of skein dyeing done in this dyehouse is comparatively small and so no particular section of the drug room was needed to house the dyes for this particular type of work. The location and layout of the drug room are of special importance in the efficient operation of a

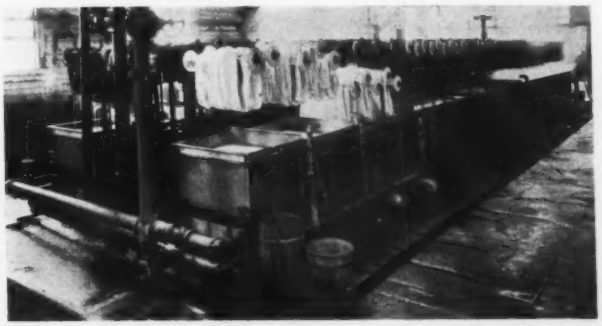
Below—Dye Reel for Tubular Knit Goods, Showing Cloth as It Is Being Dyed

Courtesy, Van Vlaanderen Machine Co.



Installation of Skein Dyeing Machine

Courtesy, A. W. Bahlmann, Inc.



Courtesy, Rochester Engineering & Centrifugal Corp.

Textile Extractor

dyehouse and among the points to be observed are the following: it should be readily accessible; construction should be such as to prevent absorption of moisture by the dyestuffs; it should contain an accurate table platform balance, etc. For further information regarding the location and construction of a dyehouse drug room we refer you to the article entitled "The Importance of the Drug Room in the Operation of an Efficient Dyehouse" appearing on page 381 of the July 1, 1935 edition of this journal. The drug room as constructed in the dyehouse which is under consideration is apparently of sound construction as no difficulties are encountered and it seems to follow quite closely the details of construction mentioned above.

Courtesy, Fletcher Works, Inc.

Textile Extractor

Below—Skein Dyeing Machine

Courtesy, Smith, Drum & Co.

A blowing system has been installed which acts to reduce the amount of steam present in the dyehouse; a number of fans placed between the skylights in the roof of the building remove a great deal of the steam vapor and except on the most humid days satisfactory conditions are maintained.

We will not go into any details as to the construction or materials of construction of the equipment mentioned as most of the readers are already familiar with such.* Inasmuch as improvements are constantly being made there is bound to be in any dyehouse, equipment, which although up-to-date, may not be up-to-the-minute and so no point would be served in describing minutely each individual piece of equipment as far as the purpose of this article is concerned. Instead it is intended to point out the layouts of specific dyehouses rather than to give details of machinery construction.

Courtesy, MacBeth Daylighting Co.

Daylight Lamp

Bangor Branch

The Bangor dyehouse of the Kayser company, as stated before, is primarily a hosiery proposition and accordingly was planned with that point in view. The details of layout are shown in the accompanying sketch. It is located in a well lighted one story building. All of the dyeing machinery is of the rotary type and constructed of Monel metal, similar to the hosiery dyeing machinery located in the Brooklyn dyehouse. The construction of the color matching room and drug room follows the general details as given for the other dyehouse.

---

*Those who are interested in reading further concerning the constuction of dyehouse machinery, including the materials of construction, are referred to the following articles as well as others which have been published:

Dyeing and Finishing Machinery for Knit Goods (Jones), American Dyestuff Reporter, Page 203, April 22, 1935.

The Materials of Dye Kettle Construction (Burke), Ibid, Page 415, July 29, 1935.

Inconel, An Alloy for Textile Wet Processing Equipment (LaQue), Ibid, Page 114, March 11, 1935.

Stainless Steel in the Textile Industry (Hinkle), Ibid, Page P191, April 6, 1936.

The Materials for Dye Kettle Construction as related to the Economical Production of True Shades (Burke), Ibid, Page 351, June 5, 1933.

Reducing Dye House Costs with All-metal Dye Kettles, Ibid, Page 515, August 15, 1932.

The Dyeing Machine (Burke), Ibid, Page 385, June 20, 1932 and Page 418, July 4, 1932.

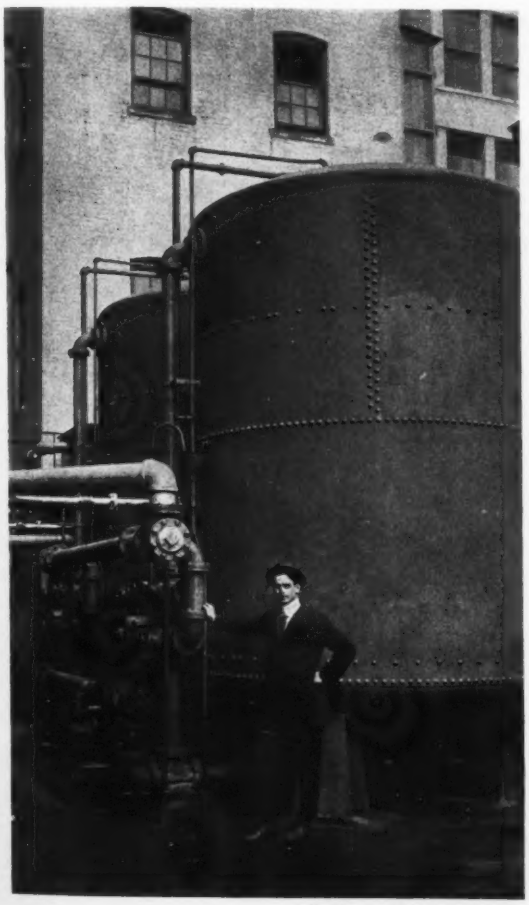
The Development of Hosiery Dyeing Machinery (Caya), Ibid, Page 241, April 11, 1932.

The Use of Monel Metal Equipment for Dyeing with Developed Colors, Stripping and Bleaching (LaQue), Ibid, Page 283, April 25, 1932.

Etc., etc.

WATER SUPPLY

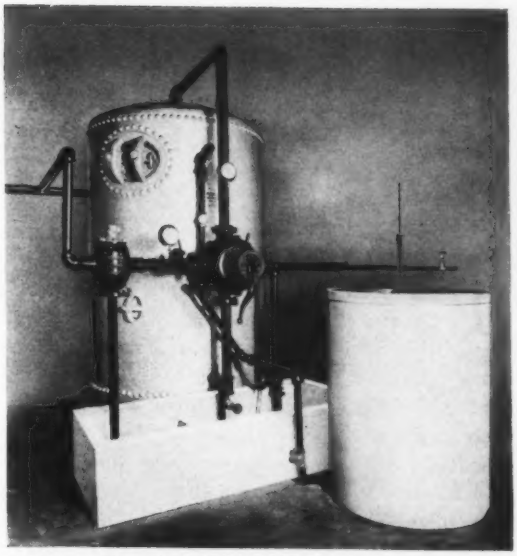
Of extreme importance in the operation of any type of dyehouse is an adequate supply of water satisfactory for the purpose at hand and so the subject might properly be included in any discussion of dyehouse equipment. This is especially true in the case of a silk hosiery dyehouse. The water should be free from harmful impurities, colorless and clear. It is practically impossible to find any such water in nature; or, if found, does not remain constantly so. For this reason, in order to avoid difficulties in the dyehouse which may be hard to trace, it is generally advisable to install some type of water filtering or purifying apparatus. At both of the dyehouses discussed in this article such apparatus has been installed thus insuring a water supply that is constant in point of hardness, color, purity, etc. Of particular interest in this connection is the accompanying photograph showing a Permutit installation at the Brooklyn branch of the Kayser Co. This



Courtesy, The Permutit Co.

One of the first Permutit installations made. Photograph taken around 1913 at the Brooklyn plant of the Kayser Co.

installation was made in 1913 and while records do not clearly show the date of the photograph, the cut of the gentleman's clothes indicate that the picture was taken about that period. This was one of the first few Permutit zeolite water softening installations made, and since then



Courtesy, Hungerford & Terry, Inc.

Inversand Water Softener with Central Control Valve

another unit has been added. Sedimentation, coagulation, filtration, settling, color removal and softening are all important in the treatment of the water supply. In addition to a supply of water which is suitable for dyeing there must also be an abundant supply of it. This depends even more on nature than does its purity, but in many cases the supply of water may be increased by proper treatment of water that may have been thought entirely unsuited for dyeing purposes. A complete discussion of conditioning water for the textile industry appears on page P43 of the January 27, 1936 edition of this journal.

The illustrations shown depict modern types of apparatus used to insure a safe and sure water supply at all times. (*Continued on page 222*)

Fully Automatic Zeolite Water Softener Installation in a Textile Plant.

Courtesy, The Permutit Co.

Thirty-Second Annual

Knitting Arts Exhibition

TODAY marks the opening of the thirty-second annual Knitting Arts Exhibition being held at the Commercial Museum in Philadelphia through Friday of this week. According to advance reports all previous attempts to present a display representing the most modern developments in the knit goods field will be surpassed this year. The exhibition is held annually in conjunction with the conventions of the National Association of Hosiery Manufacturers and the Underwear Institute. More than 200 exhibitors, representing the knitting and allied trades from twenty states, have taken space and are now exhibiting. The exhibition covers more than two acres of floor space in the Museum. Year after year, leading manufacturers have been exhibiting at this exhibition, as they realize it has assisted materially in building their business solidly for the future and in keeping their names before the trade.

On Wednesday the annual convention of the National Association of Hosiery Manufacturers will be held. Officers will be elected for the coming year and various problems of the trade will be discussed during the business session. Election of officers and transaction of business of the Underwear Institute will take place on Thursday.

Each year there have been extensive displays of dyeing and finishing machinery as well as textile chemicals which are used in the knitting field. As an aid to the readers of the REPORTER who are especially interested in this type of exhibit we present herewith a brief description of those displays in which persons engaged in the wet processing branch of the knitting trade will have the greatest concern.

AMERICAN ANILINE & EXTRACT CO.
Philadelphia, Pa.

Booth No. 209

Their new method of degumming by the use of Orthopol Concentrate is demonstrated. This new method is said to give the following advantages: (1) cutting the boil-off formula at least in half (2) elimination of any tendency to spot; (3) the lots are put through much faster as dyers are said to find their shades coming out much more uniform by this method. Numerous brands of hosiery that have been degummed by this method are also displayed.

In attendance: A. B. McCarty, Thomas P. Key, H. H. Kirkpatrick, F. A. Carsten and W. P. Gudgeon of the Canadian Aniline & Extract Co., Ltd., of Hamilton, Ontario.

BAUSCH & LOMB OPTICAL CO.
Rochester, N. Y.

Booth No. 346

A large array of optical instruments for examining threads, yarns and fabrics are display. Included is the Textile Projector which magnifies, projects and photographs fabrics. This instrument has been designed especially for the hosiery trade as it enables one to examine in detail troublesome defects; to determine their cause and to make permanent records for claim adjustments. Other instruments displayed include a new type, low cost, polarizing microscope for determining the maturity of cotton fibers by polarized light; wide field binocular microscopes; the special J Camera; the H Microscope and a special line of hand magnifiers.

In attendance: Warren S. Slocum, E. Sadler Bissell and J. I. Wexlin.

H. W. BUTTERWORTH & SONS CO.
Philadelphia, Pa.

Booth Nos. 58, 59, 60

On display at these booths is the Tube-Tex combination wet-spread, extracting and processing machine in operation, as well as photographs of Tube-Tex combination ranges which continuously and in one operation wet-spread, extract, process, dry, condition, steam, finish, measure and roll up knitted fabrics. Fabrics finished by the Tube-Tex machine are also displayed.

In attendance: H. W. Butterworth, Jr., J. Ebert Butterworth, Dehaven Butterworth, Harry Lownsbury, Wm. E. H. Bell, Mortimer Cohn, Jean Cohn and Jules Walter.

FLETCHER WORKS
Philadelphia, Pa.

Booth Nos. 205, 206, 207

Included in this exhibit is the newest model high speed Apex twister with unit control; the improved Duplex double twister with exclusive swing rings, individually adjustable and a 40-inch Fletcher Whirldwind extractor—a machine which provides the advantage of the open top without requiring any special foundation or pit. The design of the Monel metal basket is such that there are no inside rivets, seams, flanges or projections.

In attendance: Otto W. Schaum, R. J. Bartholomew, W. H. Rometsch, Jr., Charles W. Moore and H. N. Rahn.

W. F. FANCOURT & CO.
Philadelphia, Pa.
Booth No. 212

Textile soaps, oils and specialties featuring products for dyeing, degumming and delustering and also oils for conditioning and soaking silk and rayon are exhibited. New products shown include Fanco Aquapel, a splashproof or water-repellent product said to be of great stability which, it is claimed, imparts repellency and body to the hosiery, brings out the wales, gives exceptional boarding properties and imparts a smooth soap-stony feel to the hose, and Fanco Regenasol D-82, a chemical which is said to have the unusual properties of preventing and redissolving the formation of lime and most metal soaps. It is said to be of interest to the knitting trade for the elimination of smelly goods and prevention of spots.

In attendance: W. F. Fancourt, Jr., W. F. Fancourt, III, and Charles T. Harvey.

J. B. FORD SALES CO.
Wyandotte, Mich.
Booth No. 307

This exhibit consists of chemicals used in the processing of silk, wool, cotton and rayon. This company is the oldest exhibitor of specially prepared alkalies, having started in at Horticultural Hall and exhibited continuously for about 25 years.

In attendance: F. S. Klebart, J. H. Flaherty, H. E. Moyer and J. W. Turner.

GRAND RAPIDS TEXTILE MACHINERY CO.
Grand Rapids, Mich.
Booth Nos. 144, 145, 146

A hand laying-up machine for laying cotton or rayon fabrics, a rotopress for pressing sweaters and cotton underwear, two all metal scouring and dyeing machines for piece goods, general upright finisher, swatch drier and steamer to dry samples cut from goods in dye bath and extractor loader and unloader are exhibited.

In attendance: W. H. Shields and W. F. Moon.

HUNGERFORD & TERRY
Clayton, N. J.
Booth No. 140

Here is exhibited an Inversand zeolite water softener, samples of Inversand, Basex and Ferrosand zeolites, literature, photographs, the Hungerford patented copper gravel retaining screen and the Hungerford Central Control Valve.

In attendance: D. M. Hungerford, C. Hungerford, Jr., J. S. Swartley and G. Lang.

INTERNATIONAL NICKEL CO.
New York, N. Y.
Booth Nos. 13, 14

Monel metal mill and fabricated forms as regularly used in the textile industry are featured at this exhibit. Visitors to the Knitting Arts Exhibition having problems which involve the use of corrosion resistant materials are invited to discuss their problems with the attendants at the International Nickel Co. booths.

In attendance: The booths will be in charge of E. A. Turner, assisted by C. J. Bianowicz.

W. H. & F. JORDAN, JR., MFG. CO.
Philadelphia, Pa.
Booth Nos. 166, 167

This exhibit consists of textile oils, softeners and penetrating agents. Special features are their new products stable in hard water, alkaline and acid solutions. Disinfectants and insecticides are also shown.

In attendance: Canfield Jordan, H. B. Dohner, W. A. Stringfellow, R. A. Bruce, G. C. Harkins and F. T. Quinlan.

LAUREL SOAP MFG. CO.
Philadelphia, Pa.
Booth No. 178

Hosiery and other knitted products treated with Laurel soaps and finishes are on exhibition. General information concerning the complete Laurel line is available.

In attendance: A. Henry Gaede, A. L. Hayes, E. W. Seasongood, C. C. Hagelgans and William H. Bertolet, Jr.

LEATEX CHEMICAL CO.
Philadelphia, Pa.
Booth No. 40

No products are exhibited but there are present the complete Leatex staff of salesmen and technicians.

ONYX OIL & CHEMICAL CO.
Jersey City, N. J.
Booth No. 219

The Onyx Co. displays its latest developments for boiling-off and finishing hosiery and underwear, featuring the new waterproofing compound, Aquaproof-W. Samples of each compound are shown, together with samples of hosiery and underwear processed and finished with Onyx compounds.

In attendance: Charles D. Ehrengart, Walter Huber, Leon Brick, Elgar Brick, Jack Tresize, and members of Maher Color & Chemical Co., Inc., Chicago, Ill. (midwestern agency).

PERMUTIT CO.
New York, N. Y.
Booth No. 310

The new high capacity, greensand base zeolite—Super-Zeo-Dur, is exhibited at this booth. Other products on display include the single multiport valve for water filters and zeolite water softeners; the electrically controlled, motor driven, fully automatic valve for zeolite water softeners; the electro-chemical feed control unit for coagulant or lime soda treatment; the new heat reclaimers; and samples of activated carbon and the zeolites: Decalso and Zeo-Dur.

In attendance: M. F. Corin, D. J. Hess, G. A. Weinhold and W. L. Lowrie.

PHILADELPHIA DRYING MACHINERY CO.
Philadelphia, Pa.

Booth No. 177

This display consists of illustrations of the latest improved Hurricane drying machinery for raw stock, skein and warp yarns, packages, hosiery, underwear, toweling and piece goods as well as the latest developments in tenter dryers, carbonizing equipment, twist setting machines and vacuum extractors.

In attendance: W. W. Sibson, H. O. Kaufmann and C. H. Reumann will be in charge of the exhibit.

PROCTOR & SCHWARTZ
Philadelphia, Pa.

Booth Nos. 242, 243, 252, 253

A working demonstration of the Proctor & Schwartz boarding machinery for hosiery is given. Special emphasis is given to automatic devices for imparting a special finish to long, short and medium length hosiery after it leaves the hands of the boarders. A new hard finish to their hosiery boards is also shown and a modern method of obtaining equalized drying of sheer or other weight stockings throughout their entire length is demonstrated.

In attendance: Major C. T. Griffith, Chas. S. Tiers, Harry B. Lex and Wm. J. Merrigan.

ROCHESTER ENGINEERING & CENTRIFUGAL CORP.
Rochester, N. Y.

Booth Nos. 213, 214

The following equipment is in operation and will be demonstrated to interested persons: a 30 x 20 inch super dyeing machine, tub and cylinder constructed of stainless steel, cylinder to have two horizontal partitions arranged with four doors and four compartments, capacity 25 pounds dry weight; a 30 x 36 inch super dyeing machine, constructed with tub and cylinder of Monel metal, cylinder to have two horizontal partitions, four doors and four compartments; a 48 inch open top type extractor with Monel metal curb and basket and a 17 inch Monex type extractor with Monel metal curb and basket. To be noted in the dyeing machines is the spot-welded cylinder construction, eliminating rivets and bolts and making the cylinders much more sturdy and rigid. The cylinders are also embossed and hand-honed to prevent chafing. The extractors are completely constructed of Monel metal and the baskets are also embossed and hand-honed.

In attendance: R. C. Caine, C. F. Fischer and Porter B. Compton.

SCHOLLER BROTHERS
Philadelphia, Pa.

Booth Nos. 215, 216

Samples of soaps, softeners, finishes and specialties as supplied to the hosiery and knit goods trade, together with samples of fabrics treated with same, are exhibited. Particular stress is laid upon the combination, dull repellent finishes for hosiery and also on Kastilene, a protective agent for use in the dye bath on pure silk, wool, acetate yarns and all animal fibers.

In attendance: F. C. Scholler, J. F. Noble, L. M. Boyd, E. S. Atkinson and George Pickering.

SMITH, DRUM & CO.
Philadelphia, Pa.

Booth Nos. 23, 24, 25, 26, 27, 28, 29, 30

The Smith, Drum line of hosiery dyeing and skein dyeing equipment will be shown.

In attendance: Harry S. Drum, R. D. Howerton, W. C. Dodson, and J. E. MacDougall.

WARWICK CHEMICAL CO.
West Warwick, R. I.

Booth No. 336

This exhibition includes samples of the latest developments by Warwick.

In attendance: Dale S. Chamberlain.

JACQUES WOLF & CO.
Passaic, N. J.

Booth No. 353

Many chemical specialties for processing hosiery and underwear are exhibited. Included are Loupole W-950, hydrosulfites and stripping agents such as Hydrolite W-923, delusters, finishers, softeners, oils, including Monopole Oil, Oratol W-746 C, sulfonated olive and castor oils, soluble fine oils, soaking oils for the knitter, weaver and throwster and boil-off oils.

In attendance: F. G. Henckel, C. R. Bruning, M. F. Costello, W. Deuble, J. F. McDonagh, C. J. Rahm, H. Sweetman, G. W. Searell, C. E. Wright, G. J. Desmond and Arnold Pfister.

O. F. ZURN CO.
Philadelphia, Pa.

Booth Nos. 171, 172

The O. F. Zurn Co. and its textile division, Quaker City Chemical Co., Knoxville, Tenn., and the Quaker City Chemical Co., Ltd., of Canada exhibit their usual line of specialties for the textile trade. Among the new products is Esto Wax Softener for softening and finishing all types of cotton knit goods in conjunction with the Tube Tex machines. Also a new penetrant and vat assistant, Pent-Lev XXX, which is said to aid penetration and to give brighter shades and more efficient dyeing. Sulfonated castor oils, penetrants, silk and cotton softeners and a complete line of lubricating oils for hosiery and underwear mills are shown.

In attendance: William S. McNab, Alfred Winser, Robert Cowan, Harold E. McNab, E. W. Snodgrass, Robert Smith, Maurice J. Nolan, Raymond W. Zurn, Harry F. Zurn, Alex. Dahlgren, Charles J. Curran, O. F. Zurn and John L. Wilson.

PROCEEDINGS OF THE
American Association of Textile Chemists and Colorists
APRIL 20, 1936

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Standard Wash Fastness Samples

Cotton, Wool, Silk

The standard samples which have been in preparation for some time by the Sub-Committees on Fastness to Washing of Dyed Cotton and Dyed wool are now ready for distribution, and the original standard silk sample cards have been revised to correspond with the new system of classification first introduced in the 1934 Year Book.

These standards have all been carefully dyed with the dyestuffs and according to the dyeing methods recommended in the 1934 Year Book and each set includes a dyeing representing each of the different classes of fastness.

With these sample dyeings for reference it will be possible to accurately grade the fastness to washing of any dyed cotton, wool, or silk fabrics, by comparing them with the standards after subjection to the standard washing tests as approved by the Association.

The A.A.T.C.C. is now prepared to furnish these three sets of washing standards for $1.00 per set which is to cover the cost of preparation.

All inquiries concerning these washing standards should be addressed to the Chairman of the Research Committee.

LOUIS A. OLNEY,
LOWELL TEXTILE INSTITUTE,
LOWELL, MASSACHUSETTS.

Hosiery Dyeing*

By WESLEY I. PICKENS†

SOME two weeks ago when I was first informed that I would be expected to give this paper on hosiery dyeing, I was turning the subject in my mind trying to decide just what angle or phase of this subject it would be best to discuss. At that time, the thought struck me that since this section manufactures largely rayon and cotton stockings for women, also a medium grade of fancy half hose, that it would be best to discuss some of the problems involved in this type of work. Then I asked some of my dyer friends for suggestions as to subjects that they would be interested in hearing discussed. One man whom I asked the question of what would be interesting and helpful to a group of hosiery dyers, replied: "Tell them that hosiery dyeing consists of three-fourths luck, one-fourth bull, and a helluva lot of hard work and worry." This statement was made as a bit of humor, but in thinking over it later, it struck me as being somewhat true, especially the latter part. There is no class of dyeing of which I know, which has as many various fibers to dye as in hosiery, and to make matters worse, they occur in all kinds of combinations, which tend to make it more difficult.

Another friend suggested the old subject of the dyeing of pure thread silk hosiery in the one-bath, as compared to the two-bath method. This is a subject which has been discussed at numerous times before, and I do not believe that the advocates of either system have been able to establish their method as the best in the opinion of all dyers. Due to this decided difference of opinion, I was hesitant about bringing up this subject. However, my friend was genuinely interested in learning more about the comparative merits of these two systems and I therefore decided to discuss the outstanding points as I see them, hoping that from these comments and the discussion which will undoubtedly follow, that my silk dyer friends may get some helpful information.

A number of years ago, I would have unhesitatingly recommended the two-bath method, but within the last few years I have realized some of the advantages of the one-bath method, and feel that with some few exceptions, the one-bath method would be preferred. In discussing this matter, I think it would be well to outline the advantages claimed for each method.

The claims of the two-bath method are economy of dyestuffs and more uniformly working formula. The claims of the one-bath method are increased production, less handling, and consequently less seconds, and a better finish.

It is true that the two-bath method will probably save on the cost of dyes, but it is believed that this will be more than offset by the time saved on the one-bath method. I am sorry that I do not have any definite figures to give on this, but I have never had the opportunity to keep any records which would give a definite comparison along this line. However, it is my opinion that taking everything into consideration, the difference in the cost per dozen would be so small as to be negligible, and even then would probably be in favor of the one-bath method.

The question of uniformly working formula, or securing check dyeing from run to run, is one which I believe influences a number of dyers to favor the two-bath method. The proper selection of colors will give just as uniform checks from run to run, in the one-bath method as in the two-bath. I do not believe there are many silk hosiery dyers, if there are any, who do not have to make small shading adds to the majority of their runs, whether they be the one-bath or the two-bath method. These adds are generally very small, and in either case do not materially delay the completion of the dyeing. However, one point must be emphasized, and that is the selection of the proper type of colors. There are a limited number of colors which perform well in the one-bath method, and it is essential that these types be selected for this work. If, for any reason, these types are not available, then probably the two-bath method would be better.

Some dyers claim that as a rule the one-bath method will check somewhat better than the two-bath, due to the fact that when the de-gumming oil or soap is put in the bath a more or less definite pH is established, which is varied less by changing water conditions than when just the raw water is used as a dye bath.

If we admit that the one-bath formula will check as well as the two-bath, then it is certainly true that the one-bath method fulfills the claims made for it, as concerning more production and less handling of the material.

The matter of the finish is one which I am not prepared to discuss further than to say that in most cases a satisfactory finish may be given the goods, regardless of the method of dyeing. This is a field in itself and the progressive hosiery dyer is able to achieve interesting results by utilizing various combinations of the numerous finishing materials now on the market.

* Presented at meeting, Piedmont Section, Feb. 8, 1936.
† E. I. du Pont de Nemours & Co.

It is claimed by some dyers that the two-bath method takes some of the life out of the silk, due to removing practically all of the gum in the first bath, and then giving it 45 minutes to one hour in another boiling bath. To overcome this, some dyers have resorted to what is called the split bath, or a combination of both methods, which means that they partially de-gum in one bath, and then drop that bath and finish degumming in the dye bath, which has practically the same properties as in the one-bath method. In this method, the first bath is not run long enough to make it necessary to re-sack, and the material is put immediately into the second or dye bath. This system is simply a variation of the one-bath method, and I personally do not believe it has enough advantages, if any, to be chosen in preference to the one-bath method. Of course, there are some conditions where the split bath method would be desirable, as for instance, dyeing stock which is very oily and dirty. This would probably be true in starting up a mill with new knitting machinery.

As has been previously mentioned, there is made in this vicinity a quantity of ladies' rayon and mercerized cotton hose. There are several outstanding problems encountered by the dyehouse man in processing these numbers. One of the most outstanding problems is in the case of rayon when hard water is encountered. The combination of rayon coning oil, soap and hard water is one that has caused a lot of trouble. Some dyers prefer to adopt the two-bath method to remove the oil before dyeing. In this case, it would be best to give the material a good boiling off, starting at a point near the boil, with plenty of good soap or scouring oil. After some 15 or 20 minutes, the machine should be flushed over to prevent the coning oil, and soap curds precipitated by the addition of cold water, from settling on the goods. Of course, if the mill has a hot water supply, then this would be of advantage at this point. When the oil is thus removed, care must still be taken regarding hard water curds, but it has been our experience that these curds do not give near as much trouble when the coning oil has previously been removed.

Some plants find that they do not have to resort to this method, but dye in the one-bath method, and flush the machine over at the end of the dyeing period, rather than drain it. This flushing serves as a rinse, and the goods are removed without further rinsing, as soon as they are cool enough to handle. In some cases, it has been found that this method gives trouble, and that it was necessary to remove the material from the dye bath without rinsing or cooling. In this case, the goods are always sacked, and a smooth stick is used to lift the sacks from the machine. This is rarely necessary but is mentioned here because we have seen places where it is practiced.

The addition of trisodium phosphate or soda ash will help in keeping out these hard water curds. There are also on the market certain scouring compounds which will emulsify coning oils in hard water without precipitation of curds. Of course, the ideal solution of this problem is soft water.

The question of obtaining a good union between rayon and mercerized cotton toes and heels might also be raised. There are just two things to be considered in the solution of this problem: One is the proper selection of dyestuffs. There are some types of colors which will dye very good unions on these two fibers, and others which will dye anything but a union. The other consideration should be the method by which the dyeing is made. On most types of rayon we find that a dyeing started at or near the boil and salted quickly, will give more color on the rayon than when the same color is dyed by the method of starting the dyeing at a lower temperature. On some types of machines it is not practicable to start dyeing at a boil, and on some others, it is. We know of plants securing excellent unions between low luster rayons and mercerized cotton, by preparing the dye bath at the boil, and throwing in the dry material, running at the boil and salting after 15 minutes. In another case, this procedure is followed, with the exception that Glauber salt is used, and the salt is added with the dye before the material is entered.

One of the pet alibis of the dyer has always been that there is a variation in the rayon yarn. We are confident that there is not the occasion to blame the yarn as much now as in former days, although it is still true that different rayons have different dye indices and should not be mixed indiscriminately in various dye lots.

Another type of hose which gives trouble more or less regularly is the ladies plain mercerized cotton hose. Tiger stripes have been and still are periodical nightmares. We believe that in some cases when this occurs it can be slightly reduced and made to appear less pronounced by care in the dye-house, but rarely, if ever, entirely eliminated. If tiger stripes are caused by unevenly applied softening oils in the yarn, they may be improved by a good detergent and by boiling. Two tones in the same dye-bath occur more frequently on this type of hose than any other. This problem is allied with that of tiger stripes, in that in some cases there is little or nothing that can be done about it in the dye-house. However, this trouble is frequently caused in the dye-house and can be corrected there. Uneven heating in the dye machine is the first thing to be checked up on. Then again, the selection of proper type dyestuffs is important. Colors which level well and exhaust well without salt or with a minimum quantity of salt should be chosen. We believe the ideal way to dye this type of ladies' plain mercerized hose would be as follows:

1. Use pocket type machines.
2. Use carefully selected dyestuffs.
3. Use quality grade dyeing assistants.
4. Start at low temperature, raise to the boil and boil vigorously during the entire dyeing period.
5. Do not use salt.

Of course there are plants which do not have the proper

type machines and where other local conditions make it necessary to work out special procedures to dye this material.

We are having less trouble now on fancy half hose than ever before. That is probably due to the fact that every one has become more familiar with the various synthetic and natural fibers and know more about processing them.

One of the most common problems on those styles which cannot be boiled on account of sulfur dyed yarns or acetate yarns, has been spotted heels and toes occurring in very light shades. It has been our experience that this can be overcome by preparing the dye bath with the proper assistants, at approximately 170 degrees fahrenheit and entering the dry material without previous wetting out. Of course this method would not be practical in some type of dye machines.

One of the fibers which has come into use more recently on fancy half hose is spun resisted silk. It has been found that it is necessary to guard against any degree of alkalinity in the dye bath, in order to work this yarn without staining. Even a small amount of alkali in the dye bath will frequently cause dyed resisted silk to change its tone, and will also cause natural or white to become badly stained.

To attempt to discuss in detail all the various fibers and problems which enter into fancy half hose would require considerably more time than we have allotted to us. Therefore, we shall not attempt to discuss these details.

In thinking over fancy half hose dyeing problems in a general way, we always arrive back at one point; and not only in half hose, but in practically all other dyeing, we sooner or later find ourselves returning to this same point. This is, the selection of the proper colors for the work at hand. There are any number of dyes which have different properties of fastness and exhaust. There are union dyeing colors, and those that dye one fiber and leave another clear. There are colors which will dye from the peroxide bleach bath, and colors which will work well in an alkaline degumming bath. There are also colors which will not do these things. To my mind, the selection of the proper color is one of the principal solutions of all our problems, and closely allied to this is the selection of proper assistants to be used in dyeing. Then, of course, the procedure or method is also important, but to my mind it is secondary to the selection of the proper type dyestuffs.

In summing up my remarks, let me say this: A successful dyer and finisher of hosiery carefully selects his dyes and chemical assistants to fit the need at hand, then carefully selects the procedure to be followed in the application of these colors, and leaves the balance of the job to good hard common sense.

DISCUSSION

Mr. Eddy: You hosiery men, I presume, have some things you would like to ask Mr. Pickens and we invite you at this time to fire away.

Mr. R. A. Smith: Mr. Pickens has covered the field well, taking in half hose, silk and rayon, but there is one type of rayon I would like to mention that some of you fellows might have had several headaches on, I know I did. Of course, there are some of you experts who did not have headaches, but they are like the man the speaker referred to, they are pretty good, or above the average.

There is one type of rayon I want to say a few words about, that is Bemberg rayon. In the early years their rayon was more or less hard to dye, but in recent years they have been able to make them easier to dye, and *coning* oils are easier to remove.

Bemberg is a peculiar yarn. It goes back to the old problem of selecting proper dyestuffs in the beginning and once getting your dyestuff properly arranged, more or less get the unions very good. In selecting dyestuffs the problem is to select colors which would dye the cotton more than the rayon. In former years it has been the problem of selecting colors that dyed your cotton before your rayon. In this problem, it is one of selecting dyestuffs that will dye your rayon before your cotton.

Several oils and compounds have been present. Some of them dye too much, and make the stocking a little difficult to finish and hard to handle and too flimsy, and you had to put more body in it and resort to starches or compounds to put a finish in it.

The whole idea was to keep your bath as neutral as possible. We certainly had to make a good match and the more you run would make it more stiff, more harsh, so the idea was to keep your bath as neutral as possible and get the dye out as quickly as possible and this stearic acid compound not only kept the dyestuff off your heel and toe by way of film on your rayon to keep it off, but it gives the cotton a good finish, therefore you could vary your combination and your finishing compound to get the right body to your hose.

Also in strippers, I find in ordinary strippers sometimes the alkalinity was too much and you had to use more or less acid strippers, and some of the formaldehyde zinc compounds.

You would get the desired finish in the re-dye bath. This particular yarn I think out of the whole field, the latest rayon in recent years that has given more trouble to hose in the last few years, perhaps the same old argument of dyeing one bath or two baths, which we all know about, and I will not talk about.

Mr. Eddy: I am sure we appreciate Mr. Smith's remarks and would like to hear any further discussion on Mr. Pickens' paper.

Mr. T. R. Smith: What causes the reduction of black in the dyeing of silk hosiery, and is it possible consistently to prevent this reduction during the dyeing with the one-bath method?

Mr. Pickens: I feel very much like the small boy who bragged about knowing everything, and when someone asked him a question he replied, "Me and my father knows everything, and that is one of the things my daddy knows."

I have heard that question discussed, in fact as I recall, at one of the meetings of this group in Charlotte two or three years ago a paper was given dealing with that subject which I believe has been printed in the AMERICAN DYESTUFF REPORTER. That comes nearer, to me, to being the solution to your problem than anything I have seen. I think he brought out the point that several factors cause this reduction. One was prolonged boiling temperature, the other alkalinity. I believe those are the two outstanding factors. He brought out the point that boiling temperature for a long time in a neutral bath did not reduce the black as much as the alkaline bath, also temperature of 170° to 180° would not reduce the color, even in an alkaline bath.

Mr. Smith: Can you consistently prevent reduction in the one-bath method, or does the two-bath method help?

Mr. Pickens: The two-bath method would probably aid, in view of the fact that it reduces the alkali, or at least a considerable portion of the alkali.

Frankly, that is not a question I am prepared to give a definite opinion on.

If there is anyone else who wants to say something, I would like to hear from you.

Mr. Paul Mitchell: I would not say about reducing black on silk, but, Mr. Smith, don't you find Bemberg is an old-dyeing proposition?

Mr. R. A. Smith: It is, but it has not been used as much in the past as it has in recent years, but if it has been an old dye proposition it seems the dyers would have been more familiar with them when they come around.

Mr. Paul Mitchell: Mr. Pickens, what about the statement about not using salt? I find on dyeing Bemberg you do not use much salt. I have not been able to do it without any salt on Bemberg.

Mr. Pickens: I am glad you asked that. Don't you think at best the less salt you use the better result there would be on Bemberg?

Mr. Mitchell: Yes. What about keeping the combed yarn from showing through on top of the rayon after finishing. You do not have trouble about the union but still it makes the mercerized heel and toe to show through.

Mr. Pickens: I believe the best solution would be to select the size of the yarn, so the knitting machine would cover to the best advantage in plaiting.

Mr. Paul Mitchell: What do you think about running the combed yarn over a wax or binding agent and knitting and then dyeing as short a time as possible, so as not to work those fibers loose.

Mr. Pickens: Your theory is good. You mean to more or less resist your yarn so as not to take up too much dyestuff and at the same time bind the loose fibers to the body of the yarn so that these soft, loose fibers will not work through the plaiting and show on the face of the hose; however, this would not be a permanent solution and a good yarn salesman would tell you to buy a good grade of gassed yarn and you would not have this trouble.

Mr. W. A. Daniels: In answer to Mr. Tom Smith's question, I would like to say that the reduction of dye on black in the one-bath method can be eliminated.

I think this question was raised in Charlotte last November a year ago, and it was well carried on at that time. If he has forgotten that, I will bring it back to his memory, that at that time it was said that if the alkalinity of the bath was raised at the beginning of the dyeing operation, that is put the oil and the alkali in at the start of the run and then run for 15 or 20 or 25 minutes, and then add your dyestuff, the reduction of the black would not occur. That alkali that is entered at the start of the bath, we tried several, but the one that was most volatile at a high temperature was the ammonia. We used ammonia with the oil at the start of the dyeing operation and in 15 or 20 minutes added acetic acid. In that we degum the stocking and then we lower the alkalinity at that time and then enter the dyestuff. Thus you can control the alkalinity of the dye bath, which is the most important factor that causes the reduction of black, and this can be eliminated by using that method. It has been tried over a period of two years and we have not had a reduction yet.

Mr. Pickens: That is very interesting.

Mr. Grady Miller: Have you had any experience in dyeing American Enka rayon?

Mr. Pickens: No.

Mr. Miller: We use American Enka rayon, and it is always the case that the shade has to be toned up.

If we have to make addition to the dye bath after we have already salted, many times in the bath the dye will come off the rayon. We build the shade up to a perfect match in the laboratory and in the boarding room it is way off shade. It is very difficult to get enough dyestuff on it. You have to add and add.

Mr. Searell: I believe it is a change of coning material that has gone through the knitting operation. You think you have a good clean scour and sometimes you are mistaken. There are a number of mineral oils brought out in the country that are no good for rayon, and I think that is what you will find is on that yarn.

Mr. R. A. Smith: I happen to be using the same rayons in my plant and I am having the same difficulties you are. Possibly every shipment we get, about a week after we get the shipment, when perhaps we have the yarns mixed, it is a batch of rayon different from the last. It must be change in the coning materials. I have changed colors three or four times, but it is not worth the time to change colors. It washes off. It must be the pigment they use in those colors.

Mr. G. S. McCarthy: I believe when titanium pigment

was first used to deluster rayon by the rayon manufacturers, that it was found difficult, without affecting the shades during the dyeing and boarding operations.

Mr. Grady Miller: I would like to ask Mr. Smith if he is dulling any of his rayon.

Mr. R. A. Smith: No, but it does take more in proportion.

Mr. T. R. Smith: Have you ever tried using a lot of salt in your rinse bath before finishing?

Mr. Miller: Yes, and I still have the same trouble.

Mr. Mitchell: We had that trouble and did not eliminate it entirely until we used about 5 per cent Glauber salt.

Mr. Miller: You mean salty water as your rinse bath?

Mr. Mitchell: We use the regular dull finish for that.

Mr. Miller: Do you have much trouble with your unions?

Mr. Mitchell: No.

Mr. Miller: You get good union between your rayon and cotton?

Mr. Mitchell: Yes.

Mr. Pickens: I was very interested in this discussion as to Bemberg because that has been quite a problem in the last year or so. The big problem there has been union, particularly on heavy shades. The light shades were no problem.

I would like to ask these gentlemen who have had considerable experience with that if they ever use acetic acid in dyeing heavy shades?

Mr. R. A. Smith: No, I have not. Bemberg is a very heavy stocking on an average, and lays close together. I would be very dubious about using it unless I drove on most of my color with salt.

Mr. Pickens: For instance, on a navy blue shade, do you think acetic acid in the dye bath would enable you to get a better union?

Mr. Smith: I have not tried it, but I think it would.

Mr. Eddy: In your paper, Mr. Pickens, you referred to soap curds.

Mr. Pickens: That is hard water curds.

Mr. Eddy: It would be an advantage to use sulfonated fatty alcohols with the soap?

Mr. Pickens: Decidedly so.

Mr. Paul Haddock: Reference has been made to using sulfonated mineral oil. I would like to know what it is.

Mr. Searell: Sulfonated mineral oils, as I understand it, are the result of treating oils that come from the wells with sulfuric acid to try to rid them of some of the carbonaceous matter. They are treated for three successive processes with fuming sulfuric acid to try to get the color out of the mineral oil, leaving white mineral. In so doing they produce practically white oil. Whether this is the first, second or third time I cannot say, but there has been a severe inroad into animal and vegetable products with sulfonated mineral oil.

Mr. Gaede: I do not know a whole lot about it, but there are several patents on sulfonated mineral oils.

Mr. McCarthy: I think Mr. Searell is right in that description. They are emulsified and do not contain vegetable or animal oil.

Mr. Searell: Addressing Mr. Haddock and whoever may be interested. I understood from a very close friend of mine, who worked for a concern where he was given a job as a young chemist to find out about sulfonated mineral oil. Being well versed in what the chemical properties were in oil, he started to find out what was what. One of the first things, he made a test on was the iodine numbers. He found one which showed carbon deposit. He treated with sulfuric acid once and it went down, and finally by putting through Fullers earth he got a water white solution which Parke-Davis sold as a domestic type of Russian mineral oil for years.

Mr. Eddy: Is there any other discussion on this paper? If not, we wish to thank Mr. Pickens for his time and effort.

CALENDAR OF COMING EVENTS

Meeting, New York Section, Swiss Chalet, Rochelle Park, N. J., Friday, April 24, 1936.

* * *

Spring Meeting, Southeastern Section, Thomas Hotel, Auburn, Alabama, April 25, 1936. Speakers: Prof. Robinson, A.P.I., "Termites and Their Control"; S. M. Edelstein, A.A.T.C.C. Research Assistant, "Mercerization Research, Its Value and Practical Application"; D. H. Powers, Rohm & Haas Co., "Permanent Finishes on Textile Fabrics".

* * *

Annual Meeting, Providence, R. I., December 4 and 5, 1936.

Spot-Proofing and Repellent Finishes on Hosiery*

By L. O. KOONS†

THE subject upon which I have been asked to speak is a very interesting and lengthy one, but due to the short time allotted me, I will be able to touch only upon the more important phases.

Spot-proof and repellent finishes are often referred to as water-proof finishes, but the latter term is incorrect when used in describing hosiery finishes.

Water-proofing means making impervious to water and air resistant. Manifestly, then no fabric is water-proof, unless it be impregnated with a solid film, such as rubber coated fabrics. It is evident that coating a stocking with such a film will rob it of all its elasticity, and make it unfit for wear. The proper terms to describe hosiery finishes of this type would be water-resistant or water-repellent. Such finishes are "porous to air, but will shed water up to a certain extent, without wetting the fabric." This is due to the increase of the surface tension.

Water repellent finishes consist principally of metallic soaps such as zinc, aluminum, copper, etc., combined with organic protective colloids such as waxes, resins, gums and glues. They are highly dispersed colloidal solutions of these materials with soluble polyvalent electrolytes, giving a positive charged solution. These highly dispersed particles of the colloidal dispersion or emulsion, having a positive electrical charge, incorporate themselves with and penetrate into the structure of the fabric, which has a negative charge. The reason for this is the opposite electrical charge.

Finishes on the market today require only one bath for their application, but even then the hosiery dyer is confronted with the perplexing problem of change in shade and color, the silk usually becoming fuller and more intensified, and the cotton portion usually lighter.

It is a well known fact that certain dyestuffs are more sensitive to pH changes than others. pH of 1 per cent solutions of these finishes vary from 4.0 to 6.0. This refers to those that have aluminum bases. The finishing bath, is, therefore, really acid in reaction, and it is generally known that some of the neutral silk dyestuffs have a greater affinity for silk in an acid bath. Further, certain dyestuffs are intensified when treated with metallic salts or repellent compounds with metallic bases.

In order to minimize these conditions, the hosiery dyer should:

1. Select those dyestuffs that are least affected.
2. The hosiery, after dyeing, must be thoroughly rinsed before finishing.

If the hosiery is not rinsed thoroughly, the excess dye liquor retained in the bath or goods will have a greater affinity for the silk fiber, thereby increasing the intensity of the shade.

3. Hosiery should be extracted immediately after being taken from the finishing bath, and the time of extraction should be definite, and once determined, should always be the same on that particular style and weight of goods. Extracting too dry, or if the hosiery is left for a considerable period of time before boarding, will cause it to dry out in spots. The finish is drawn up from the wet portion by capillary attraction, thus causing marks, streaks and an uneven finish. If left too wet, the finish will drain to the bottom of the batch and likewise will produce uneven results.

Hosiery should be *boarded* as soon as possible after extracting. When it is necessary to leave the hosiery over night or over week-ends, cover with a wet cloth, or store them on racks in a well ventilated, moist room or cabinet, to prevent them from drying out.

Fashion today demands more than a straight, repellent finish. Low luster, body and snag resistance are prime requisites of the proper hosiery finish. These add to the dyer's woes, but processes have been developed whereby all of the above properties can be imparted to the fabric in one bath, by using a compound for each purpose. This is usually done by adding them one after another, at five-minute intervals, giving time for one to react with the other, and allowing the chemical reaction to take place, not only on the surface of the fiber, but to penetrate into the fiber.

Research has shown that it is not the temperature of the application that really affects the shade, but the temperature of drying. This is evident when one considers that chemicals are left on the fiber, and that they become concentrated as the fabric has become dried and shaped. Boarding temperatures vary from 140° to 240° F., depending on the type of forms or drying system used. There is less change in shade when the stockings are dried at low temperatures, and practically none at normal temperatures.

The usual temperature of the finishing bath varies from

* Presented at meeting, Piedmont Section, Feb. 8, 1936.
† Scholler Bros., Inc.

80° to 120° F., and it has been found that the higher temperatures are the best, as penetration is greatly increased, the take-up is better, and the finish more permanent. Repellent finishes, after they are once dried, possess remarkable resistance to laundering, and their repellency, dull finish and body are retained indefinitely if the hosiery is washed with care, according to standard procedure.

The protective film that repellent finishes impart, becomes permanently fixed on the fiber, and seals every filament of the thread, one to another, into practically a solid thread, free from straying or loose filament ends. This protective film absorbs the first shock of frictional wear, preventing filaments from being pulled out of the thread structure by abrasion or snagging. It reduces internal friction on the fabric structure induced by abnormal strain. It permits a smooth, free slippage of the thread over thread, under stress with less tendency to cut through one another and cause runs. It also overcomes the effects of alkaline damage encountered in previous processing, such as soaking, boiling-off and dyeing. It restores and maintains the elasticity of silk, proved by increased length of fabric. Boarding, examining, pairing, are facilitated, and seconds are reduced.

The silk is left sufficiently elastic to accommodate itself to the shape of the leg of the wearer, and will not lose its elasticity and become baggy after a period of wear.

Actual wearing tests show that hosiery treated with repellent finishes are more snag resistant, less apt to develop runners, and actually give better and longer service than untreated stockings.

You will notice on these photo-micrographs that we have made, the differences of the structure and appearance of the stocking. No. 1 shows the stocking taken directly from the dye bath, rinsed and boarded without finishing. You will notice the stocking before finishing has many loose filament ends and distorted loops, with no uniformity. This condition is caused by processing. No. 2 was taken after the same stocking was finished. It shows the loose filament ends sealed, the wales straight, free from distortion, and held in that state, as the hosiery manufacturer intended them to be, giving the hosiery the desired sales appeal.

DISCUSSION

Mr. Eddy: Does anyone wish to ask Mr. Koons any questions?

Mr. Searell: There was one point in the paper about alkalinity and acidity, etc. I forget where it came in, but you said something about the thing should be at a particular point of acidity before it would take on finish, or vice versa. Do you attribute that to an iso electric point of degummed silk?

Mr. Koons: Yes, the finishes are acid in reaction, and of course, they are absorbed to a greater degree in an acid bath.

Mr. Searell: It does not have a selective absorption.

Mr. Koons: It does in that acidity, or in the pH range of 4 to 6.

Mr. Byrd: I would like to ask Mr. Koons to what extent the finish is permanent, that is, how many washings will it stand before it is completely removed.

Mr. Koons: That depends, of course, on the amount and type of finish applied. Ten per cent of finish, calculated on the weight of the goods, will withstand ten ordinary soap washings or launderings, and still retain a high degree of repellency.

—♦♦—

Direct-Color Photography

with the Agfacolor Plate*

By A. C. SHELTON†

THE subject of color in photography is of steadily increasing interest, and you will see rapid developments and great progress in the field of Direct-color Photography in the next few years. I shall discuss the subject briefly, considering particularly the Agfacolor Plate, probably the highest development yet attained with the so-called "screen-plate process" of Direct-color Photography.

In considering this subject, we should give some thought to the formation of color, because the underlying principle of the formation of color is of importance in any consideration of Direct-color Photography.

All color is formed by the breaking up of a ray of white light. If you pass a ray of white light through a prism, that ray of light is bent out of its original path twice,—once when it enters the prism, and a second time when it emerges from the prism,—and this results in the formation of a band of colors known as the spectrum. This spectrum may really be considered an artificial rain-

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bow containing all visible colors, beginning with red at the red end of the spectrum, continuing through orange, yellow, green, blue-green, blue, to violet, and including all intermediate shades and tints. Should you take another prism of the same angles as the first and place it against the first prism in an inverted position, you throw this ray of light back into its original path, and the band of spectral color disappears.

This is probably the most common, best-known, and most easily understood example of the formation of color by light. The rainbow is really a spectrum, the colors being formed by the dispersion of white light when this light is refracted by moisture in the atmosphere in that portion of the sky away from the sun.

Another interesting example of the formation of color by light is to be found in the feather structure of certain birds. Among the brightly colored, iridescent feathers of some birds, there is absolutely no pigment whatever, but the color is formed by the breaking up and dispersion of a ray of white light through the microscopic structure of the feather.

As white light falls on objects of any kind, it is either all absorbed or all reflected, or it is partly absorbed and partly reflected. When all light which falls on a given object is entirely absorbed, then there remains no white light to be reflected and form color, and the result of this total absorption of white light is an object black in color. However, if the light which falls on an object is entirely reflected (or transmitted), the result is white. When there is an equal absorption and reflection of light by an object, the result is a neutral-gray tone. Where absorption and reflection are unequal, color results, and all objects retain their individual colors, depending entirely upon the manner and degree to which white light is either absorbed or reflected by the objects themselves.

In considering color by light, the three basic primary colors of the spectrum are red, green, and blue-violet. By the admixture of these three colors, all other tints and shades are produced, and the proper combination of these three colors also produces pure white. A scientist by the name of Clerk Maxwell was one of the first to experiment with the application of the formation of color by light to direct-color photography. He made three crude filters by making three glass cells. One of these he filled with a green fluid, another with a red fluid, and the third with blue-violet. He then made three photographs, one through each of these filters. Next, he made three positives for projection and used three projection lanterns. Over the lens of the first lantern, he placed this same green filter; on the second lantern, the same red filter; and on the third lantern, the same blue-violet filter. He projected the positive images through these respective filters from the three lanterns, superimposing the images one upon the other. Thus he produced crudely one of the earliest pictures made by a direct-color-photographic process.

In the same way, it is possible to take three projectors with colored discs over the lenses, and with exactly the right combination of green over one lens, red over another, and blue-violet over another, project so that when the three are superimposed,—the result on the screen will be, if exactly the right combination is used, pure white light.

Generally speaking, direct-color photography is of two different types. The first may be considered as the color-separation type in which color-separation plates are made. The second type is known as the screen-plate process in which a color screen is used in conjunction with the photographic plate, and this is the type of direct-color photography which we are considering, and of which the Agfacolor plate is an example.

The screen-plate process itself is also of two types. The first is the type in which is used a regular or geometric pattern in the color screen. In both types the color screen is composed of minutely small dots or squares of the three basic primary colors of red, green, and blue-violet. In the regular or geometric type, the color screen is ruled onto a glass screen, the minute rulings of red, green, and blue-violet resulting in tiny squares of the same three colors in a regular geometric pattern. When this type is used, exposure is made with a "taking screen" held in close contact to a panchromatic plate. Positives are then made from the resulting negative and these positives are bound up in exact register with a "viewing screen," and when transmitted light is passed through the plate, accurate detail of color is secured if the positive and the "viewing screen" are in correct register. Also in the regular or geometric type of color transparency, the color screen may be ruled onto the film base itself, in which case the film base becomes the support for the color screen rather than a glass plate. In this type of transparency, the color screen becomes a part of the transparency itself rather than a separate screen, as briefly outlined above.

In the case of the irregular or non-geometric type of screen-plate process, of which the Agfacolor plate is an example, the color screen of red, green, and blue-violet is built into the plate itself. The color screen of the Agfacolor plate is made of microscopic droplets of dye in the three basic colors of red, green, and blue-violet. These three colors are mixed together and so emulsified that each individual droplet maintains its own individual form, and this mixture is coated upon the glass plate. When these droplets of dye dry, the edges of one run into the edges of the other, with the result that the plate is coated with a fine, microscopic, irregular, mosaic pattern of red, green, and blue-violet dots, so microscopically small that it requires about three million of them to cover a square inch. This forms the so-called "color screen" of the

Agfacolor plate. The plate is now coated on top of the color screen with a very fast and very delicate panchromatic emulsion, and a black card is placed against this emulsion to protect it from injury in handling.

When the plate is loaded into the camera, it is loaded in backwards; that is, with the glass side of the plate towards the lens, because it is necessary for light to pass through the lens, through the glass plate, through the color screen, and then strike the photographic emulsion. If the plates were not loaded correctly, but were exposed in the ordinary way with light striking the emulsion first and the color screen secondly, a perfectly good black-and-white picture would result, but there would be no color in it. Exposure with this plate is necessarily longer than black-and-white due to the fact that light must penetrate the color screen before striking the sensitized emulsion.

Filters are necessary, not in the sense that ordinary yellow filters are used in black-and-white photography, but rather to control the actinic blue so prevalent in the atmosphere. For normal daylight scenes, a No. 20 filter is used, which controls the ordinary blue in the atmosphere and gives the resulting plate correct color balance. A No. 21 filter is used where the intense blue of high mountains, seashore, and similar locations makes its use necessary or desirable. A No. 22 filter is generally used for sunsets, sunrises, and similar scenes which are usually rich in reds and yellows, but weak in actinic blue.

The foregoing comment applies primarily to the use of the Agfacalor plate outdoors, but it can be used with equal success on indoor work. It is not practical to mix daylight and artificial light on indoor work, and it is better to work indoors either by all daylight or all artificial light. In working with daylight indoors, longer exposures are, of course, necessary, and a No. 20 filter should be used. In working under artificial light indoors, either photoflash or photoflood bulbs may best be used, and with both of these bulbs no filter whatever is necessary.

In view of the fact that the plate is placed in the camera with the emulsion surface away from the lens, it is necessary in focusing to compensate for the thickness of the glass, and this is most safely and accurately done by reversing the ground glass in the camera. It is also easily done by simply focusing with the ground glass in its normal position and then racking back the thickness of the glass plate. It is always best to expose color plates as soon as this can reasonably be done after the holders are loaded, and it is also essential to develop the plates reasonably soon after exposure. After exposure, the plate is developed and reversed to a positive by three short and relatively easy steps.

The first developer is a metol-hydroquinone developer, in which ammonia is used instead of carbonate. This first development brings out the negative image as in black and white, and, if exposure is correct, development is complete in approximately three minutes. The plate is removed from the first developer and given a thorough rinsing in running water. It is then placed in a reversal bath consisting of Potassium Bichromate and Sulfuric Acid, which eats out the blackened silver which was exposed in the original exposure and turned black in the first developer. After the reversal bath has acted on the plate for about one or two minutes, a white light is turned on, and from thereon the operation is continued in white light.

For best results, I find a 60- or 75-watt frosted Mazda bulb placed about eighteen inches above the developing tray very satisfactory. A small-size photoflood may also be used. The turning on of this white light gives the plate its second exposure, exposing that silver which was not acted upon by light in the original exposure and which was not removed by the reversing bath.

The reversal operation is complete in three or four minutes. The plate is again thoroughly rinsed in running water and is placed back in the first developer or in a separate tray of developer. For this second development, the first developer or any good M. Q. Developer can be used. The action of this second developer is simply to turn black this remaining silver which was not exposed in the camera, but which was exposed when the white light was turned on during the reversal process. One or more plates may be developed at a time, but fresh developer must be used for each operation due to the fact that the ammonia evaporates very quickly, and the developer is rendered impure if the second development is carried on in it. Under no circumstances should the first developer be used for the first development a second time. When the plate is completely blackened, a matter of probably two or three minutes, it is thoroughly rinsed and, if necessary, intensified or reduced.

This is a reversal process, and the results are, therefore, just the opposite to a black-and-white negative. An *under*exposed color plate is, as a result, black, dense, and heavy; while an *over*exposed plate is thin, transparent, and lacking in color brilliance. It is possible to reduce an underexposed plate, though difficult to do it satisfactorily, and I do not recommend it because, while the plate can be reduced and made more thin and transparent, the reduction process is bound to take away a great deal of the color and beauty of the plate. However, it is possible to intensify an overexposed plate very satisfactorily, using a mercurial intensifier. As a matter of technique, I make it a practice to fully expose and fully develop all of my plates, then intensify all of them to give me greater color brilliance and the utmost transparency. The result of this reversal process is a positive, and the densities of this positive are correlated to the red, green, and blue dots in the color screen, through which light passed in the original exposure. Now when transmitted light is passed through this color screen and through the photographic-positive image which lies in the emulsion, the full

brilliance and sparkle of natural color is reproduced not only in great beauty, but with infinite and accurate detail.

This in a general way covers the Agfacolor-plate process and its manipulation, and as a demonstration of the result which it is possible to secure with this plate, I shall show you a series of color plates entitled, "Beautiful New England," made entirely with this process. I shall be very glad to have you ask me any questions as to any points or problems of interest to you, and I shall answer them to the best of my ability.

DISCUSSION

Question: Do your plates keep for ever or do they fade?

Answer: No, they do not fade. Some of mine have been projected continually for five years, and I can see no change in them. It is essential that color plates be projected through an air-cooled lantern, as they will not stand the heat from an uncooled lantern. The heat will blister the emulsion and ruin the plates. The lantern I use is one of the new type made by the Spencer Lens Company, which is built with a fan, providing a draft of cool air which keeps the condensers and the plates cool; and it is the only type which can be safely used for color-plate projection. Projection is a rather difficult problem because you must get ample light through the color screen in order to project successfully, and this type of lantern is the most successful on the market. If you were to take these plates and hang them in the sunlight (as in a window) it would in time bleach out the color screen, but in normal handling they will last indefinitely.

Question: You said most of them were intensified.

Answer: Yes. I work for brilliance, and at the same time a transparency, and I get that by giving good full exposure and full development. I develop just a trifle thin, then intensify, which gives me both a transparent plate which projects easily, and one which has a great deal of color brilliance.

Question: They are redder, aren't they?

Answer: No, I would not say so. I don't think it will give you a redder plate; it will give you a more transparent plate.

Question: A little control over the voltage will bring out more beauty, won't it?

Answer: Yes, it will. It shows especially as you fade the light down.

Question: That image of the water was very beautiful when fading away?

Answer: Yes, and in some of the Autumn colors you will get richer color. You will realize, of course, that, in the case of autumn foliage and in many of these scenes, I have watched and waited for my opportunity until I could get a particularly colorful day on which to work. That day across the hills from Peterboro to Keene was a condition I might rarely find.

Question: The first picture of that scene was a reflection in a pond. The colors in the water were much more brilliant than on the foliage. If you had a filter which would give you a sky effect, wouldn't that show the foliage better?

Answer: Yes. There are several ways you can hold back the sky, but if you do you will throw the color balance out. This is done not so much by a color filter as by holding back the light. A screen on the upper part of the lens with fine holes in it will hold back the light from the sky.

Any reflection, as you look at it with the eye, is always darker and more intense in color than the object itself; that is, in normal sunlight.

I think you will find that to be the case if you observe the next time you see a reflection in a pond or mill stream. You will find that the reflected object is always deeper and darker than is the scene itself, and of course your camera picks it up the same way.

Question: Where your enlargement is gray here, is the grayness you got on the screen due to the color filter or to the projection?

Answer: You have reference to patches of open sky, etc. That is due mostly to the color screen, I should say, partly to your enlargement, and partly to the glass beading on the screen,—the three of them combined,—especially if you are fairly close to the screen.

Question: Is it essential to use a fine-grain developer?

Answer: No. The developer used on this is a developer containing ammonia instead of carbonate,—a metol developer with ammonia. That is the best we have found. It isn't essential to use a fine grain developer.

Question: How are your dye drops kept separate?

Answer: When they are manufactured, they make up a quantity of the green, the red, and the blue-violet. These are emulsified so that the individual droplets do not run back together again. When they come to mix the three together, by the law of average they become scattered over the plate in an irregular mosaic pattern.

Question: Then the edges of one dry into the edges of another by attraction?

Answer: Yes.

Question: Do the dyes dissolve in water?

Answer: I believe not.

Question: I think it is the finest collection of pictures I have ever seen. They are simply wonderful, but just because I am naturally disagreeable, I should like to know how many seconds you make.

Answer: That is a rather personal question, but I have absolutely no secrets whatever. There are days when I go out with ten plates and come back with nine. There are other days when I go out with ten and am well pleased if I get four. It depends entirely upon the way in which you work.

Question: What proportion of plates do you expect to lose?

Answer: I should say by working carefully without trying to get unusual effects—such as rainbows and other difficult subjects—you ought to get about eight out of twelve if you stick to good common-sense practice. You must use flat, even lighting for best effects, because strong high-lights "burn out" and deep shadows are too black,—so if you stick to good normal flat lighting and use normal exposures, the number of "seconds" should be relatively small. In the case of the rainbow plate in the surf spray, that was an interesting exposure because the duration of that rainbow was short.

I timed the rainbow with my camera shutter, and it lasted a little less than 1/5 of a second. So I used an exposure of 1/10 of a second, and out of three plates exposed just one caught the rainbow.

Question: Will you please give us your opinion of the value of the photo-electric device to a photographer?

Answer: Absolutely fine. It is as nearly accurate as anything could be, and I recommend it very highly. To any one who is not familiar with color plates and wants a meter as an exposure guide, I'd say the photo-electric type is the best he can use.

Question: Could you tell us again about the mercury intensifier?

Answer: I find the most satisfactory to be the so-called "Agfa Mercurial Intensifier." You cannot use an intensifier of the copper type, as it will give you brown stains, but a good mercurial intensifier will work O.K.

Question: Do you dry your plate first?

Answer: No. I intensify while the plate is wet. It is difficult to soak up a dry plate, and it is apt to stain and streak. After the second development, I immediately intensify,—continually examining the plate until intensification is complete,—then rinse and dry with an electric fan.

Question: Do you harden with Formaldehyde or anything else just before the intensification?

Answer: No, I don't. I don't see why it couldn't be done. The emulsion in the summer time, unless you use ice, is very apt to get soft, and I see no reason why you couldn't harden it successfully.

Question: Do you develop in darkness with a time factor or such device, or by inspection?

Answer: I develop by a combination technique that I have worked out for myself. With the green light shining on the timer, I unload the plates in darkness and place in developing tray. I have my developer in a graduate, as I prefer to pour it over the plate rather than immerse the plate in the developer. In total darkness I pour the developer over the plate, then rock the tray until the developer has been acting on the plate for ten to fifteen seconds.

After development has proceeded for ten or fifteen seconds, the image takes form and, if exposure is correct, the image shows up as black against white. I leave the plate in the tray and watch the image build up, as you cannot examine it by transmitted light.

If at the end of ten or fifteen seconds the image has built up normally, I carry development for three minutes. At the end of ten or fifteen seconds, if I find the image has scarcely taken form, I know the plate is underexposed, and I carry development to five minutes or longer if necessary.

On the other hand, if the image has flashed up black, I know the plate is overexposed, and I may develop only a minute and one-half or two minutes. In that way, I control development,—a combination of inspection and time.

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Dyeing and Finishing Machinery
Who Should Select It?

THERE is apparently a difference of opinion as to who should be "sold" when the matter of purchasing new equipment for the dyehouse or finishing room comes up for discussion. To us it becomes obvious that the person who must be satisfied in this respect is the dyer or finisher who will use the machinery and who is responsible for the production and quality of its output. It seems only natural to us that machinery should be selected which, *in the opinion of the dyer or finisher,* is most suitable for their purposes. If they are satisfied who can complain? Surely not the mill owner who has to depend upon the dyer or finisher for satisfactory results in each particular department.

In most mills the opinions of the dyer and finisher are highly regarded when the question of what particular type or manufacture of wet processing machine should be installed. However in some mills this happens not to be the case. We can only advise the mill owners in such cases that they would be wise to consult with their foremen before purchasing any equipment. It is only to be expected that these foremen are in a position to offer sound advice as to the particular features of equipment which would be most suitable. If you were purchasing a new automobile you would naturally buy one to suit your own requirements as you are the one that must use it; the same reasoning should apply in purchasing mill equipment. Let the person who must use it and who must be satisfied with its performance specify its purchase. What do you think?

Communication
Re Current Governmental Policy

Editor, AMERICAN DYESTUFF DEPORTER.
Sir:—

In a recent issue of *Monsanto Current Events,* Mr. Edgar M. Queeny, president of the Monsanto Chemical Company, appears as the author of a most interesting imaginary conversation which might have taken place between himself and his grandfather, were the elder Queeny suddenly to return to present-day America and view the industrial, social and political changes which have occurred since the time of his death in the last century. The resultant conversation is extremely interesting and I recommend a thoughtful perusal of the article to all who find themselves wondering just where present governmental policies are leading the nation.

In particular, Mr. Queeny's comments on current taxation are most apropos. He goes so far, in fact, as to question whether Monsanto Chemical Company would ever have come into being had present taxation schedules been in effect at the time of its inception. He points out that capital for new enterprises is generally furnished by men of large means, whose incomes are oftentimes taxed from 60 per cent to 75 per cent of their total amount. Under these circumstances, it is obviously extremely difficult to interest capital in a speculative venture wherein, if successful, 75 per cent of the profits must be paid to the government but where all the losses, if unsuccessful, must be shouldered by the investor.

The taxation phase of present administration methods, serious as it is, would not be so bad if the governmental income thus derived were providing amply for the entire expense of government, with a reasonable margin left over for sinking fund purposes. When we consider, however, that tremendous as the governmental income is, it provides for only a little more than half of current expenses, the outlook is unquestionably alarming.

But even the sorry financial picture is not, in my opinion, the most disturbing phase of present governmental policy. The threat to individual rights and liberties which is contained in many of the more recent acts of the federal government jeopardizes the entire social basis upon which the United States has grown to be the most prosperous and probably the happiest nation in the world. When we consider that government agencies acting under the direction of the executive venture at will to seize, wholesale, telegraphic communications of such a privileged nature as those between lawyer and client, doctor and patient, husband and wife, in an effort to discover something which may be of advantage to the administration, it is but a step to such acts of tyranny as censoring of the mails, tapping of telephone wires and the placing of dictaphones in offices and homes, which form part of the reputed daily routines of the governments controlled by Messrs. Hitler and Mussolini.

I do not question that the federal government and its advisors are sincere in their belief that the measures which they advocate are for the good of the nation as a whole. Yet there can be little doubt that these tendencies, if uncurbed, will lead in due course to the loss to American citizens of such valued heritages as the right to freedom of speech, popular assembly, ownership of personal property and the free enjoyment of the fruits of individual effort.

It behooves all of us who value these heritages to think seriously as to where current trends of government will lead us and to protest to the extent of our ability against those acts which, in our opinion, tend toward the substitution of a dictatorship for our valued political freedom.

Faithfully yours, A. P. H.

Kapok Filling Material

By SAMUEL MOSKOWITZ, WILLIAM LANDES and DAVID HIMMELFARB*

INTRODUCTION

IN PREVIOUS papers[1, 2, 3] the authors have described the use of cotton fibers from wastes by the bedding and upholstered furniture industries for filling purposes, have indicated a new chemical test to differentiate between new and second-hand material, and have shown that microscopic studies of the fibers of the filling material will aid in fixing the origin of the material.

Of the vegetable fibers used by the industry for filling purposes, kapok ranks next to cotton in its consumption by the trade. For the purpose of filling, its non-hygroscopic character, softness, and resiliency have caused it to be referred to as vegetable down. For example, a single size mattress filled to a given thickness would require about 18 pounds of kapok compared to 27 pounds of horse hair or 30 pounds of straw. This use of kapok in considerable quantities by the trade, has necessitated the testing and inspecting of numerous samples by the laboratory of the Division of Bedding, New York State Labor Department, to determine whether the material is in conformity with Article 25-A of the General Business Law, which provides for proper designation of contents and type of fillings of bedding and upholstered furniture sold in the State of New York.

TECHNOLOGY

Kapok fibers are the fibers enveloping the seeds in the fruit of *Bombacaceae* which are widely spread over tropical countries. The fruit is in the form of pods similar to our own milkweed. The greatest source of kapok is the Dutch East Indies where it is extensively cultivated in great plantations, and a goodly amount comes in from Ecuador and other South and Central American countries. As in cotton wastes, there are all kinds of qualities. In some cases the country to which the material is being shipped is a designation of a particular quality, in others the shipping source is the quality designation. Cross and Bevan[4] have described ways of determining qualities of kapok based upon the color reaction with phloroglucinol, the higher qualities showing little coloration, the lower qualities a reddish brown coloration; the microscopic inspection for uniform fiber diameters; the flotation test in alcohol of sp. g. 0.92. For general purposes however, visual inspection is sufficient for quality determination.

The literature and commercial publications describe in detail the processing of the fibers, to separate them from the seed and other foreign material. The structure of the kapok fiber and its microscopy have also been extensively covered. The fiber is considered as a long hollow tube, air-filled, and when mounted in liquid medium has the appearance of a long tube filled with air bubbles. The buoyancy of kapok is due to the air in the hollows of the fibers. There are given considerable data on the chemical constituents of kapok such as pentosans, cutine, protein, ash, etc.; and indications that amounts of these materials can serve as a means for detecting adulterations. Practically, such tests aside from being laborious to determine, are no better than others for determining adulterations.

Adulteration of kapok is a practice that is common. The adulterants may be varieties of tropical milkweed, especially the fibers from the pod of the plant *Asclepias*, or may be cotton or other fibers intimately mixed with the kapok. In some cases a visual inspection will be sufficient to detect adulterants, in other cases ultra-violet fluorescence and chemical treatment are necessary. The chemical method is based upon the different colorations produced, depending upon the degree of lignification, when fibers are treated with stains. The Behrens test using malachite green and benzopurpurine dye, the aniline sulfate, and phloroglucinol tests were found to be unsatisfactory for our purpose, because of the fact that filling materials include the lower qualities of the fibers and the degree of lignification does not seem to be very dissimilar for materials of low quality. The oxamine red test suggested by Lejeune[5] has been found to be useful. Milkweeds usually stain a dark maroon, kapok green, and cotton red. The stain Neocarmin W, commercially procurable, has also been found of value. Microscopic tests are valuable, but the adulterant may not be detected because the small portion of fibers teased out may not include it. The mixture is never so intimate that any small clump will be representative. The ultra-violet fluorescence of different fibers, if the fibers are in large enough aggregate, will sometimes show up the adulterant. Kapok displays a bluish fluorescence with a yellowish cast, cotton a purplish to ivory fluorescence, and milkweed usually a yellowish orange fluorescence. In short, specific tests for adulterants cannot be fixed, but resort must be had to chemical, ultra-violet, and microscopic methods, as outlined.

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*Bedding Division Laboratory, New York State Department of Labor. Publication approved by L. A. Havens, Director.

[1]Moskowitz, Landes, and Himmelfarb—Amer. Dyestuff Rep., XXIV—Aug. 12, 1935, p. 463.

[2]Moskowitz, Landes, and Himmelfarb—The Bedding Mnfrer—XXXI—Oct., 1935, p. 42.

[3]Himmelfarb, D.—Amer. Dyestuff Rep.—XXIV—Dec. 2, 1935, p. 671.

[4]Cross and Bevan—J. Soc. Dyers and Colourists, *32*, 274-8 (1916).

[5]Lejeune: Bull. Soc. Chim. Belg., *34*, 419-22 (1925).

DIFFERENTIATION BETWEEN NEW AND SECOND-HAND KAPOK

After kapok has been used as a filling material in an article for a number of years, the fibers become very much broken up and the resulting aggregate becomes powdery in character, the degree depending upon the length of service. Visual inspection is sufficient for second-hand classification, although chemical proof is desirable, if the material is extremely powdery. Visual inspection is of no avail if the material is powdery to a small degree or if it is blended with new kapok. Such mixtures are detected by chemical means only. The ultra-violet fluorescences of new and second hand kapok are generally different, the new showing a blue fluorescence with yellowish cast in most cases, while the second-hand a dull ivoryish fluorescence. There are samples of new kapok, however, that have a fluorescence resembling some second-hand kapoks, so that the fluorescence of the sample under ultra-violet light is not even as useful an indication with kapok as it is with cotton filling materials. However in mixtures, a partial separation under the ultra-violet light is usually possible, so that chemical analyses may be made on the second-hand portion of the sample. The chemical tests employed in the distinguishing between new and second-hand kapok fillings are the determination of the amounts of ammonia and urea in the material. The first two papers by the authors[1, 2] indicate the source of ammonia and urea in filling materials as body emanations, urine, perspiration, to which the material is exposed upon use, and outline the method of determination of ammonia and urea content. For cotton fillings, the dividing line between new and second-hand material was fixed at 0.030% ammonia or 0.010% urea, or both. The experimental work described in the two papers was repeated with a number of new and second-hand kapok samples, and the results obtained tabulated in Tables I and II.

Analyzing the data cited in the two tables, it is evident that a differentiation between new and second-hand material can be made on the basis of ammonia and urea content, if we arbitrarily fix the dividing lines as 0.030% ammonia content or 0.015% urea content. These criteria will exclude all the new material encountered with a comfortable margin. Of the many samples examined, there was never found a case where only the urea content was high. If urea was found in amount over 0.015%, the ammonia was always higher than 0.030%. Thus, the ammonia content alone is sufficient to differentiate new from second-hand kapok.

A sample should be designated as second-hand if the urea or ammonia content, or both, are greater than 0.015% and 0.030%, respectively.

The ammonia and urea contents of kapok are not affected by exposure to air saturated with water vapor. As with cotton however, the fluorescence will change to resemble that of second-hand material.

In addition to the chemical differentiation between new and second-hand kapok, other bases for such differentia-

TABLE I
New Kapok Specimens

No.	Type	% NH_3	% Urea	% Na_2SO_4
1.	Japara	0.016	0.009	0.14
2.	Japara	.011	.001	.06
3.	Japara	.005	.005	.01
4.	Japara	.008	.005	.02
5.	Japara	.009	.011	.01
6.	Japara	.005	.005	.02
7.	Japara	.003	.007	.03
8.	Japara	.012	.004	.01
9.	Japara	.009	.002	.05
10.	Japara	.008	.003	.04
11.	Japara	.003	.009	.05
12.	Japara	.008	.000	.00
13.	Japara	.006	.003	.00
14.	Japara	.006	.001	.02
15.	Japara	.005	.006	.00
16.	Japara	.007	.005	.00
17.	Japara	.008	.008	.03
18.	Japara, Australian quality	.017	.005	.12
19.	Japara, San Francisco quality	.010	.004	.01
20.	Java Curl	.021	.013	.22
21.	Sourabaya	.004	.006	.01
22.	Sourabaya	.009	.002	.02
23.	Celebes	.007	.003	.05
24.	Macassar	.010	.005	.02
25.	Private Estate	.005	.002	.01
26.	Silowac	.003	.001	.03
27.	Silowac	.005	.001	.01
28.	Silowac	.006	.004	.02
29.	French Indo-China	.014	.010	.02
30.	French Indo-China	.010	.002	.05
31.	Philippine	.008	.003	.00
32.	India	.012	.004	.01
33.	India	.009	.004	.17
34.	India	.016	.006	.07
35.	Peru	.008	.000	.01
36.	Peru	.012	.003	.01
37.	Brazil	.008	.003	.02
38.	Ecuador	.009	.003	.02
39.	Ecuador	.024	.010	.12
40.	Ecuador	.006	.007	.03
41.	Ecuador	.017	.001	.56
42.	Ecuador	.009	.000	.33
43.	Ecuador	.006	.002	.01
44.	Ecuador	.010	.002	.01
45.	Ecuador	.007	.006	.01
46.	Ecuador	.009	.009	.02
47.	Ecuador	.010	.004	.01
48.	Ecuador	.011	.002	.03
49.	Brazil milkweed	.011	.004	.02
50.	Brazil milkweed (paina)	.013	.005	.02

TABLE II
Second-Hand Kapok Specimens

No.	% NH_3	% *Urea*	% Na_2SO_4
A.	0.041	0.009	0.44
B.	.079	.048	.36
C.	.058	.002	.42
D.	.088	.057	.44
E.	.421	.001	2.38
F.	.059	.001	0.74
G.	.065	.007	.77
H.	.074	.009	.74
I.	.060	.014	.58
J.	.128	.012	.45
K.	.191	.000	1.59
L.	.047	.015	0.42
M.	.132	.004	.80
N.	.049	.035	.59
O.	.058	.010	.39
P.	.067	.000	.70
Q.	.097	.013	.68
R.	.061	.017	.36
S.	.044	.004	.33
T.	.034	.009	.24
U.	.094	.001	.58
V.	.102	.016	.49
W.	.035	.008	.26
X.	.041	.000	.46
Y.	.034	.047	.13

tion were attempted. These included wax determinations, ash contents, and buoyancy tests. Generally, the results obtained from new and second-hand samples were overlapping and not amenable to classification.

SUMMARY

1. Adulterants of kapok for use as a filling material, can be detected by utilizing chemical stains, microscopic and fluoroscopic examinations.

2. Second-hand kapok can be distinguished from new kapok by chemical analyses for ammonia and urea.

3. Unused kapok shows an ammonia content less than 0.030%, while second-hand shows an ammonia content above 0.030%.

PROTECTING BELTS FROM FRICTIONAL ABUSE

IT would be hard to say how many transmission belts are forced to operate daily under conditions which cannot do otherwise than shorten their life. If and when a belt is properly lubricated, and runs upon the pulleys without trouble, it is safe to say it will have far greater life than one which is continually giving trouble. In some places, it is not uncommon to see a belt which tries to run off of the pulley, and which is forced to stay in place by means of a stick nailed alongside the pulley, or some similar crude device. One does well to remember that if the pulleys are in proper alignment, and the shafts upon which they are mounted are parallel, there will be no difficulty whatever in keeping the belt where it belongs, especially if the pulleys are crowned a little, or turned high in the center. Where the edge of a belt is rubbing against a stick, it soon becomes worn, and all too often the laps will open up along the abused edge of the belt. That is the beginning of the end, so far as the useful life of the belt is concerned. When a belt wants to run off, check pulley and shaft alignment, and correct where needed.

Another place in which belts are quite often abused is where they run over a small pulley fairly close to the plant floor, and where a gravity-type idler or so-called wrapper pulley is used. The belt is flexed around a very short radius by the wrapper pulley, and if anything is allowed to come in contact with the belt at this point, it is very hard on it, and may easily cause the laps to open. Care should be taken to guard such drives at the small-pulley end, as a matter of protection for the belt as well as for workmen. It is interesting to note that in some of the modern wrapper-pulley installations, the wrapper pulley is mounted on a swinging pair of arms that cover and practically enshroud the small pulley around which the belt is wrapped. Thus the advantage of a high percentage of belt-and-pulley contact is obtained with minimum belt tension, and with first-class protection for the belt itself.

Knit Goods Dyehouse—

(*Continued from page* 203)

AGE OF MACHINERY

While this article has discussed the layout of machinery in a knit goods dyehouse we have not gone into any details as to the condition or age of the machinery. It so happens that the machinery in the dyehouses described has been kept up-to-date but such is not true in many cases. It is not to be interpreted from this article that proper layout, location, lighting, water supply, etc. will provide an efficient working basis if the equipment in your particular plant is obsolete or not in good working order. There is no substitute for modernization in the dyehouse; to be sure there are advantages to be gained by the proper utilization of what equipment is placed at your disposal but to attempt to compete in today's market with yesterday's equipment is foolhardy and expensive. To determine whether your equipment is out of date simply figure out the savings that can be made by placing new equipment in your dyehouse. You will probably be surprised at how much can be saved in this manner.

ACKNOWLEDGEMENT

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New Oil for Old Lamps

A Survey of Possible Applications by Silk Throwsters of Newly Discovered Chemical Products

By J. M. F. LEAPER, F.A.I.C.

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IT is more than likely that the first textile fabric which came to light in the course of the interesting but unwritten history of the human race which followed the reign of the Java man was composed of filaments spun by a far less spectacular organism, an ignoble worm, perhaps in extreme *ennui* at his (or should we say her) lapsing individual existence as a mere thirty-day mulberry masticator, and totally oblivious of the commercial importance his self-made winding sheet was to have in the subsequent history of mankind.

What irony lies in the fact that such a low-down-in-the-scale creature as the silkworm without even a backbone to boast of, let alone a modern, well-developed, thoroughly advertised (and sometimes head-lined) sex-life as *homo sapiens* came up through the ages to inherit, should be destined to create the fiber that composes a fabric that even now after the most highly trained brains of this industrial era have all but exhausted the possibilities of synthetic chemistry, has no near rival either in the strength necessary to lower the modern Daedalus unharmed from the skies or in the sheer beauty called for in the adornment of the limbs of the latest front row of the Follies chorus.

The unknown fabricator of the first crude silk weave was spared the necessity of inventing a spinning method since his continuous fiber was already prepared for him, whereas the more involved mental processes necessary for the evolution of a thread from wool or from cotton delayed the appearance of the more generally useful fabrics from these fibers until much later. There were two other main reasons why silk weaving probably preceded the weaving of the heavier staple fiber goods. First of all since civilization in general grew northward, the warmer Asiatic tropical and subtropical zones which were the cradle of cultural development were the center of the earliest workings of the human brain in the direction of aesthetic expression as well as in other ways and it is in precisely these regions that the silkworm flourishes.

Here legend leads us back to the Empress Hsi Ling Shi as the mythical discoverer of the beautiful fabric whose soft threads have played such a vital part in orienting the later steps of the restless spirits of the adventurous West seeking the legendary wealth of the Indies and Cathay, and whose soft folds have been associated with beauty and romance for thousands of years. Another reason why woolen and much later cotton fabrics were far behind in the race was that in the strictly utilitarian communities of the colder North where necessity was the only mother of invention and where the superior warmth of these fabrics should have the greatest appeal, the development of various methods of tanning the animal skins which were already at hand as by-products of the tribal hunting life had produced more or less satisfactory cold weather habiliments and the dormant inventive minds of the race did not have the necessary impelling urge to arrive at the mental conception that a more comfortable and useful covering could be arrived at by dispensing with the pelt of the sheepskin and concentrating on the wool alone.

The earliest weaves of silk though no doubt seeming to their fabricators so beautiful that an imperial edict forbade the disclosure of the secret to outsiders under penalty of death, would probably appear very crude to the sophisticates of today who could certainly find in profusion in the nearest chain store materials which would far outshine those early fabrics of the Emperor Huang Ti. Also our modern viewpoint regarding the necessity for protecting the secrecy of the superior products of our industrial civilization has so far changed from the days of the Great Wall, that far from trying to keep the output of our proud machine age at home, we sometimes appear to be willing even to go to the length of using armed force to persuade the less enlightened members of the human family to shade our more elaborate mantels.

The main differences between our woven silk fabrics of today and those of four thousand years ago are of course chiefly due to differences in the weaving methods of the two eras and much less to the changes in the fiber. Certainly a modern loom or still more a full-fashioned single unit knitting machine would be as utterly inconceivable to the ancient Chinese as the final destined form of the human family may seem to the present strife-torn nationalistic era, when our poor haphazard system of economics and tariffs will give way to a frontierless land without artificial distinction of race and where the franc, mark and rouble will be found only in museums keeping company with the prayer-wheel from Tibet and the head-dress of the medicine man of the Zulus.

The silkworm has changed its habits very little since its product began to become useful to man. Mainly its evolution since being taken over by the silk cultivators has

been along the lines of uniformity of type, the cocoons selected for carrying on the succession being chosen with this object in view. Evenness of fiber diameter is the main desideratum since upon this depends chiefly the market value of the reeled skein. Biological researches such as Professor Bridges of the California Institute of Technology has made on influencing the genes of the fruit fly in the course of a few generations to create entirely new characteristics by shooting at chromosomes with X-rays and thereby causing far-reaching changes in cell structure and physiological functions, have apparently not been made on the silk worm, but such experiments might be expected to lead to important economic results in producing in a short time new and useful fiber characteristics in the silk filament which otherwise might take centuries to come about if left in the slow hands of Mother Nature.

The treatment of the cocoons previous to reeling off the filaments to be combined into skeins is probably done today in very nearly the same way as it was for many hundreds of years, any improvement in the reeling operations being to a large extent due to improved mechanisms. Certainly some study has been made of the effect of hard water in the reeling basins, but judging from the amount of lime still found in the gum of the reeled silk one may conclude that hardness was not found to be objectionable from the standpoint of the filature, though lime troubles still cause heart-breaks in some dyehouses.

With regard to the evaluation of the raw reeled silk, it is remarkable that the attention of the purchaser is not more drawn to the fact that the evenness rating does not necessarily refer to the boiled-off fiber. Although the buyer pays a premium for a high degree of evenness he is after all working on the assumption that gum and fiber run proportionately, i.e., that a 92 per cent evenness for example in the gum will also mean a 92 per cent evenness in the boiled-off yarn. Remembering that the finished goods are sold on the basis of how they look when they come from the dyer and not their appearance after knitting or weaving, it will be evident that boiled-off evenness is really what the manufacturer wants. As the silkworm certainly does not invariably proportion his exudation as between fibroin and sericin, it follows that some further criterion than the usual seriplane test on the gum silk would be most desirable to the purchaser of raw silk.

Passing over the usual hand test for "nature" as practically without any useful significance we find that a great deal of thought has been devoted to attempting to interpret the variable proportion of sericin A and sericin B in terms which might be of use to the throwster in the soaking room, but here again the relative solubility of the gum in water will not necessarily be related to how it behaves in various soaking baths. Regarding the treatment of the reeled silk in preparation for the doubling, spinning and coning operations, it appears that in spite of the mighty advances which have been made in colloid chemistry in recent years, remarkably little change has taken place in the choice of the main soaking materials used. It is probable that olive oil and perhaps coconut oil were used in conjunction with some mild alkali such as wood ashes from time immemorial for soaking silk. Apart from the fact that olive oil is usually substituted by the cheaper neatsfoot and soap is sometimes added, it would seem that many throwsters are softening their raw silk in very much the same way today. Even the use of the ordinary types of sulfonated oils is after all quite a minor advance in this art since the only result is a somewhat better dispersed emulsion and perhaps a more even tint. As a set-off to this the throwster suffers a loss of material in that the finer emulsion is not so well taken up by the fiber and the economy of the process is lessened.

It is remarkable that with so many possibilities in the way of new materials to choose from, the traditional oils and soaps have carried on practically to the present day. A systematic study for instance of liquid waxes both natural and synthetic, in the broadest sense, i.e., esters of fatty acids has never been made. A few isolated examples have no doubt been tried, perhaps sperm oil being readily obtainable has been hesitatingly given a chance to show what a liquid wax might do. But here the chances of an adulterated product are so great that it may well be that some possible value of this wax was overlooked. Assuming that a liquid product is necessary, (although it has not yet been proved that solid fats or waxes are necessarily objectionable provided they melt below the knitting temperature), a series of esters containing a lower alcohol with a higher fatty acid such as butyl stearate, and a series made with a higher alcohol and a lower fatty acid such as cetyl laurate, could be given a thorough systematized tryout and it is indisputable that a careful study of the running properties of the resulting silk would disclose relationships between the latter and the structure of the soaking oils which would lead to widely useful generalizations. Higher liquid (unsaturated) fatty acids combined with higher saturated alcohols, such as cetyl oleate, could also be contrasted with combinations of higher unsaturated alcohols with saturated fatty acids, e.g., oleyl laurate. Dibasic alcohols such as ethylene glycol combined with a series of suitable fatty acids to make dibasic fats like diglycol palmitate, might also confer properties to thrown silk which could not be attained by any naturally occurring oils since dibasic fats are never found in nature.

The resources of synthetic chemical manufacture have made available today very many such products having the obvious physical properties requisite for the work and with the not too remote chance that one or more of them may have some at present indefinable quality that might revolutionize the throwsters methods. Some of these compounds are being today studied by one or two workers, but only slow progress can be made in going over the group of possibilities when production schedules must also be met at the same time. A little cooperation amongst

those who should be interested in this work would enable important conclusions to be arrived at years in advance.

A still more likely field in which to hunt for the perfect soaking oil and one which is further again removed from the time-honored fats, lies in the compounds of phosphoric acid with alcohols and phenols. Originally commercialized by Lindsay of the Celluloid Co. for plasticizers in the celluloid and synthetic resin field, these compounds especially tricresyl phosphate show promise of filling needs which have been felt by the silk manufacturer for many years. This latter compound is made commercially by treatment of cresylic acid with phosphorus oxychloride and in contradistinction to the natural fats which contain three monobasic acid groups combined with a trihydric alcohol, it contains three monohydroxy groups (cresol groups) combined with a tribasic acid (Phosphoric acid).

Tricresyl phosphate comes into commerce as a pure white oily liquid, odorless and neutral. It is heavier than water and requires special methods for emulsification. It has remarkable softening and plasticizing properties on many types of gum resins and synthetic plastics and shows promise of conferring special properties on silk soaked with an emulsion containing it.

Being heavier than water it may be mixed with hydrocarbons or fatty oils or liquid waxes according to the results sought for, in such proportions that the resulting oil has the same density as water. It can then be emulsified in a colloid mill or by other means with the use of a minimum amount of emulsifying aid such as soap, etc., and the resulting emulsion is almost quantitatively taken up by the silk.

Apart from possible advantages in the use of tricresyl phosphate in throwing silk, its presence in the grey goods after knitting or weaving is of great advantage to the dyer since on being treated with a mild alkali in the boil-off bath it breaks down to cresylic acid and sodium phosphate both of which are especially useful in emulsifying mineral oil. The net result is that it is impossible when using a reasonble proportion of this product in soaking, to encounter difficulty in removing any mineral oil which might come from careless lubrication of knitting or weaving machinery. Its presence has other very useful properties in dyeing by the single bath method which are difficult to obtain in any other way, and if the cost of this product can be brought somewhat more into line with the ordinary natural oils it promises to have extensive use in silk soaking.

Many other examples might be cited to show how new materials may be made available for use in the processing of this oldest of textiles, but the main idea put forward is to make a special pleading that we should not leave the synthetic fiber manufacturers all the initiative in the application of new materials to textile uses, but in an endeavor to make the queen of fabrics of still further utility to her loyal followers to let our approach to her majesties special problems be more from the direction of the laboratory than from the weaving shed.

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Hosiery Dyeing*

Dyestuff Selection and Processing Methods Employed with Silk and Rayon Fibers

By H. T. MUDFORD

PURE SILK hose generally met with is that which consists of a pure silk panel and cotton tops, toes and heels. The cotton portion may be either mercerized or unmercerized. A degumming process is necessary and is carried out on the lines indicated for pure silk, namely, treatment in liquor at boiling heat containing 8-10 pounds of soap per 100 gallons of liquor. This is followed by rinsing and dyeing. The dyeing is carried out by neutral acid dyeing colors, preferably by those which leave cotton reasonably unstained, and cotton colors which possess little or no affinity for pure silk when applied from a neutral dyebath.

In view of the fact that both fibers possess affinity for neutral dyeing direct cotton colors, it might be supposed that this class of dyestuff might be employed exclusively. The fact is, however, that each dyestuff has its own degree of uniformity on the two fibers, some displaying a preferential affinity for the one and some for the other fiber, but all to differing degrees. The adoption of such a procedure would, therefore, give rise to two-tone effects, which, of course, would be very objectionable. Another objection which would arise is the fact that cotton colors possessing affinity for pure silk would tend to feed on to the silk the longer the dyeing process continued, and as it is not possible to fix a definite time limit where shade matching is concerned, the use of cotton dyestuffs could not be accepted. The exception is in the case of black, when direct cotton dyestuff may be employed exclusively.

The fact that penetration of seams, etc., is so important makes it essential that the dyeing process should be carried out at boiling heat. Dyeing is carried out in a bath which may contain a little soluble oil or soap to assist in levelling and penetration, Glauber's salt being added to obtain the necessary exhaustion of the dye-liquor. The amounts of

*Abstract of an address to the Leicester Textile Society, printed in "The Hosiery Trade Journal."

dyestuff are so adjusted that both fibers dye up to the same shade. As the proportion of silk to cotton is not standard, definite recipes which would apply to all qualities of pure silk hose cannot be established and the commission dyer is called upon to make suitable adjustments during the dyeing process.

The use of separate degumming and dyeing processes is by no means universal in the hosiery trade, some dyers preferring to carry them out simultaneously. In such circumstances the dyebath is made up with the quantity of soap necessary to effect the removal of the gum and the dyestuff is added in the usual way. After a suitable time has elapsed to ensure degumming, the Glauber's salt is added to bring about exhaustion.

This method, as will be understood, necessitates the use of more dyestuff than would otherwise be the case, owing to the detergent action of the soap. It is stated however, to possess the advantage of giving the goods a fuller handle owing to the fact that the gum is not as completely removed as would be the case if the processes were separate. From the point of view of production, the one-bath method offers apparent advantages.

The oils used in lubricating the silk for textile processing can be a source of embarrassment to the dyer and at times call for suitable means of removal. This is particularly the case where mineral oils predominate. Should their presence in substantial quantity be unsuspected, greasy scums are likely to arise in the degumming process which cause serious spottings of the hose.

DYEING VISCOSE HOSIERY

Viscose hose may consist of panels made up from either full luster viscose or delustered viscose and the cotton toes, heels and tops, may be either mercerized or unmercerized.

Owing to the heavy use of oil in lubricating the viscose yarn prior to knitting, an efficient cleansing operation is necessary before dyeing and the use of specially emulsified solvents is necessary if the subsequent danger of spotted goods is to be avoided. Should any oils remain on the goods after scouring, the chances are that they will become aggregated and form globules of fatty matter and once these have formed and settled on the goods, their removal presents considerable difficulty. The choice of lubricant is a matter which obviously greatly affects the dyer and should lubricants which are readily emulsified be found satisfactory for lubricating purposes, they should be used in preference to straight mineral oil, on account of their easy removal during ordinary cleansing.

As would be expected from the nature of the fibers, direct cotton colors are employed for the work, the blacks being after-treated with formaldehyde to obtain satisfactory washing fastness or else diazotized and developed with an appropriate developer. The use of sulfur blacks for this class of hose is quite permissible, but it is not a common practice.

The actual dyeing operation, so far as direct cotton colors are concerned, is carried out at boiling heat to ensure penetration, Glauber's salt being added to exhaust the dyebath. Soap or soluble oil may be added to assist in the penetration.

The use of fully lustered viscose with unmercerized cotton presents considerable difficulty in that all except light shades tend to dye up darker on the panel than on the cotton. Blacks in particular tend to dye up very greyish on the cotton portion, a feature of which is made more apparent by the dull appearance of the cotton in relation to the luster of the viscose. Mercerized cotton, on the other hand, presents no such difficulty except in light shades, where the cotton tends to dye up the stronger.

The selection of dyestuffs is very important, both from the viewpoint of avoiding differences in depth between the two fibers and also for the avoidance of two-tone effects. Although direct cotton dyestuffs are those most suited to application to both viscose and cotton, the relative affinities for both fibers vary and the degree of uniformity on the two is not the same throughout the range. For instance, two dyestuffs may in themselves give reasonably uniform results, but should one slightly favor the cotton and the other the viscose, a mixture of the two would be entirely unsatisfactory. As a very large proportion of hosiery shades are mixtures of three dyestuffs, the importance of selecting them can be fully appreciated. Such factors, in conjunction with the questions of penetration and washing fastness, strictly limit the dyestuffs available to the dyer of all types of hose consisting of artificial silk of the regenerated cellulose type along with cotton.

In contrast to fully lustered viscose, the behavior of the matt fiber seems more in accord with that of mercerized cotton and furthermore the appearance of the silk justifies such a choice of cotton.

A further complication is at times introduced into viscose hose in the form of a thread of pure silk running through the panel. Its presence makes the dyeing operation less straightforward for the dyer, as the best dyestuffs for giving uniformity of shade on viscose and cotton stain pure silk considerably and although precaution may be taken to keep this tendency in check, the tone of the silk thread needs correcting, for which neutral dyeing acid colors may be employed. It might be argued that the presence of so small a proportion of pure silk would not be noticed, but it is a fact that a deviation in its shade or depth produces a very undesirable speckled effect.

Viscose hose may also be manufactured with wool toes, heels, etc. In dyeing such hose it is customary to work on similar lines to those adopted for pure silk hose containing cotton, namely the use of cotton dyestuffs which leave wool reasonably unstained and employing for the latter portion, neutral dyeing acid colors which impart but little stain. It has been found that if cotton colors are employed which display any appreciable affinity for the wool, they tend to dye the latter fiber to an increasing extent as dyeing continues.

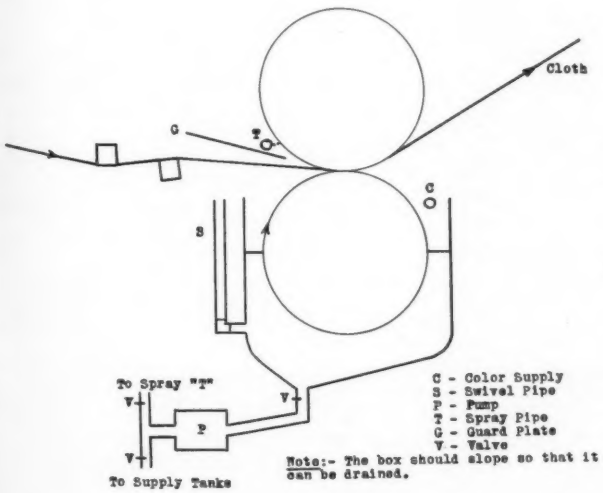
Indigosol Plain Shades

THE different substantivity of the Indigosols is sometimes the cause of a variation in shade in a given lot and also of the so-called ending of a run i.e., the last of the padded goods being a lighter shade than the beginning.

The following method tends to eliminate such faults and gives more easily level, even, uniform and dependable results and is a modification of the process as outlined in the Sol. K 60 book on the dyeing of Indigosols.

Instead of passing the cloth through the liquor in the pad box as indicated on page 17 of Sol. K 60 book, run the goods at a slight downward angle direct to the nip (see sketch).

Feed the color across the back or front of the color box below the cloth by the T pipe "C". With a separate small gear pump P connected with the bottom of the color box pump the liquor and spray it with a T Spray "T" the full width of the cloth against the top bowl two or three inches above the nip in front and above the cloth (see Sketch).



The cloth can be protected from splashing if necessary by a guard of smooth metal "G". The excess color will run back into the color box.

The solution should be fed into the color box at such a speed when running that the liquor is kept at the same level while padding.

This can be easily accomplished if a small swivel overflow pipe "S" is provided entering the color box about one-third the distance from the bottom of the box and reaching to the top of the box when upright. By turning the swivel down and the color being allowed just to trickle out slightly, the level can be kept constant.

The pump should be also piped so that the color in the box can be pumped back into the supply tank when this is needed to make a change in the padding liquor.

A rubber hose connection with a bent pipe on the end to hook into the tank or vessel into which the color is desired to be placed is a good arrangement.

The cloth after padding can be batched up before developing or if it is to run continuous, sky for a few seconds to allow the color to be well absorbed by the cloth before it is run into the developing bath of sulfuric acid.

Where goods are to be batched up it is better not to pad over 120° F. to 140° F. when using Indigosol Golden Yellows IRK and IGK straight or in combinations.

It is a good idea if the color box is cold to run the bowls in the hot color and pump the color back again and then start with more color the same temperature that one will have when running.

The developing acid should be kept at the same strength and temperature and approximately at the same level in order to keep the shades uniform.

The temperature can be kept fairly constant without a thermostat if a dry steam coil is used.

A thermostat is however the ideal way of keeping the temperature uniform. Keep the acid feed about the same temperature as the acid bath.

The strength of the acid developing bath can be kept reasonably constant; by feeding in the acid double the strength of what one starts the bath, i.e., if one starts the bath with 25 lbs. sulfuric acid to 60 gallons water, it should be fed with an acid containing 50 lbs. sulfuric acid to 60 gallons.

If the color nips give a good dry squeeze and the top bowl of the acid nip be run without set but just the weight of the bowl, then for every gallon of color used, one supplies one gallon of strong feed acid and the easy acid nip will allow 2 gallons of acid liquor to be carried out by the cloth.

This condition will keep the acid the correct strength and the level fairly constant.

Titration of the acid with an alkali before and while running will show what adjustment is needed, if any, of the acid nip i.e., whether more or less set, is required.

With deep shades of Indigosol Red Violet IRH the color made up as directed in Sol. K 60 page 8 may crystalize out when it comes into contact with a cold bowl or pipe and cause specks of strong color on the cloth.

This separating of the color may be prevented by adding one per cent of Diastafor or Exsize to the solutions and by keeping the solution hot.

This modified method of running is to be recommended for all Indigosols as it will insure level results and overcomes the difficulties which one encounters when colors of different substantivity are used together.

The pump and spray enables one to run at various speeds and insures excess of color at the nip on top of the cloth. The bottom bowl carries up liquor from the color in the box to the underside of the cloth.

New Products—Trade Notes

• NICKELSWORTH

The March-April issue of *Nickelsworth,* publication of the International Nickel Co., has recently been distributed. Illustrations of some of the equipment used in the dyeing and finishing plant of Bertram Goldberg, Inc., Johnstown, N. Y. are included in this issue. Copies are available upon request.

• GRASELLI MOVES

Offices of the Graselli Chemical Co. which have been located in Cleveland since 1867 were being moved to Wilmington, Del., the first of this month. The transfer is expected to be completed by late summer. Graselli Chemical Co. is one of the subsidiaries of E. I. duPont deNemours & Co., Inc.

• ZINSSER RELEASES

Zinsser & Co., Inc., announce release of the following products: *Solocyl Fast Blue GL, Solocyl Fast Violet RL* and *Solocyl Fast Red BL* for acetate silk. Solocyl colors are said to possess excellent light fastness. It is further claimed that due to their slow exhaustion, good leveling and penetrating powers, they are especially suitable for piece goods, yarn and novelty goods. In addition, they are said to possess good fastness to water, washing and perspiration.

• CIBA RELEASES

Ciba Co., Inc., announces release of sample cards describing the following products, manufactured by Society of Chemical Industry in Basle:

Neolan Dyestuffs—piece dyeings said to be fast to light, perspiration and wear. This card illustrates by means of 33 dyeings on wool pieces, a variety of the most suitable colors and combinations for the production of seasonable shades said to have the best degrees of fastness to light, perspiration and wear. These dyestuffs, it is claimed, are offered as a solution of the problem of what dyes to use in the production of a satisfactory degree of fastness to light, perspiration and wear. Sample Card No. 1298.

Ciba and Cibanone Dyestuffs—fashion shades. This card illustrates 60 types in two percentages as well as 236 fancy combinations. The dyestuffs shown are said to be those noted for fastness to light, wear, water, washing and exposure to weather. The dyestuffs are available in micropowder, powder and paste form. Many of the pastel tones have been dyed with the aid of Albatex PO, as leveling agent. Sample Card No. 1234a.

Cibanone Blue RS, Alkaline printing process, (pat. applied for)—illustrating a new printing process which is said to yield stronger and much bloomier prints than the ordinary potash process. This process utilizes an addition of strong caustic soda liquor to the British gum thickening; after printing, goods are dried, aged, oxidized and soaped at a boil. The new process is said to be adapted for both cotton and rayon fabrics. Sample Card No. 1342.

• S. O. C. M. A. MEETING

The regular monthly luncheon-meeting of the Synthetic Organic Chemical Manufacturers Association was held at the Chemists' Club, New York, N. Y., on Thursday, March 26, 1936 at 12:30 P.M. There was discussion concerning the reciprocal trade pacts, the Knutson-Shipstead bills relating to a tax on imported vegetable oils and attention was called to the newly formed organization, the "Raw Materials National Council".

• GENERAL RELEASES

General Dyestuff Corp. announces release of the following new circulars:

Rapidogen Red IGG—a new Rapidogen color producing very bright shades of red said to be of very good fastness to light, washing and chlorine. As far as the light fastness is concerned, it is said to surpass most of the well known Rapidogen colors. It is best dissolved with the aid of Cellosolve and printed and acid aged, according to the usual method for Rapidogen colors. Circular I. G. 1148.

Silk Fast Grey BB—a homogeneous dyestuff said to have very good fastness properties. It is stated that it is well suited for the dyeing of pure and weighted silk and shows a very good dischargeability. Circular I. G. 1122.

Algosol Brown IBR—produces brown shades said to be of excellent fastness to light, washing and chlorine. It can be used both for dyeing and printing purposes. Its chief advantage is said to be its excellent solubility, which is far superior to the solubility of Algosol Brown IRRD. It is also claimed that it has very good fastness to hot pressing and that it hardly changes shade under artificial light. Circular Sol. 61 (for printing), Circular Sol. 62 (for dyeing).

• FEBRUARY CHEMICAL IMPORTS

Industrial activity in the United States was strikingly reflected during February in record imports of chemicals and related products, which at present consist chiefly of raw and semi-manufactured materials, according to C. C. Concannon, Chief of the Commerce Department's Chemical Division.

The value of such products received from foreign countries during the month totalled $15,200,000 compared with $12,264,350 in January, and were 50 per cent higher than in February a year ago, when the total was recorded at $9,995,700, he stated.

The gains were due in large part to heavier receipts of paint oils, waxes, crude and semi-manufactured medicinal products, and fertilizer materials, preliminary statistics show. Imports of most manufactured products, including coal tar dyes and matches declined.

• FEBRUARY CHEMICAL EXPORTS

The foreign demand for American chemicals and related products continued very active in February, the total value of such sales being recorded at $11,651,000, according to C. C. Concannon, Chief, Commerce Department's Chemical Division. This compares with export shipments valued at $9,444,000 during the corresponding month of last year, $8,870,000 in February, 1934, and $6,474,000 for February, 1933, official statistics show.

Every major classification shared in the stimulated foreign demand during February, particularly sulfur, coal tar products, including dyes, medicinals, paint products and fertilizers, Mr. Concannon stated.

• MATERIALS HANDLING EQUIPMENT

A new, fully illustrated, colored folder on materials handling equipment, showing many standard and special devices for handling practically any product, merchandise, goods, or materials, that is manufactured, stored, shipped, or handled, has just been issued by Lewis-Shepard Co., Watertown, Mass., copies of which may be had free on application.

• A. I. C. MEDAL

The medal of the American Institute of Chemists, presented annually for outstanding service to the science of chemistry or the profession of chemists in America, has been awarded this year to Dr. Marston Taylor Bogert, professor of organic chemistry at Columbia University, according to an announcement made by President M. L. Crossley. The award is made in recognition of Dr. Bogert's outstanding service as a teacher and as an investigator in the field of organic chemistry. He is a former president of the American Chemical Society and of

the Society of Chemical Industry of England, Nichols medalist for 1905, and former officer of many other chemical societies in the United States. Foreign governments, universities and scientific organizations have awarded him decorations, medals, degrees and honorary memberships. He is president of the Columbia Chapters of the American Association of University Professors and of Sigma XI, as well as of the Alumni Association of the Graduate Schools of Columbia University, a member of the Board of Managers of the New York Botanical Garden, is the representative of Columbia University on the Board of Trustees of the New York College of Pharmacy, and was one of the organizers of the National Research Council.

The subjects of his researches are chiefly synthetic and lie mostly in the aromatic field. Forty-two original papers on quinazolines have been published and twenty-two on thiazoles. His work has involved studies in dyestuffs, pharmaceuticals and perfumes and especially the dependence of properties upon molecular structure. Many hundreds of new compounds have been synthesized under his direction.

The medal will be presented to Dr. Bogert at the annual dinner of the American Institute of Chemists, which will be held in Buffalo, New York, May 9, 1936.

• CARBIC RELEASES

Carbic Color & Chemical Co. announces release of circulars on the following new products:

Indigosol Brown IBR—a new addition to the Indigosol range, said to be distinguished by excellent fastness properties, including extreme fastness to light. This product, it is stated, should prove of interest to dyers and printers as a self shade as well as in combinations. It is also said that it will be useful as a component color for tans and greys in padding. Printing instructions are given in circular Sol. 61 and dyeing instructions in circular Sol. 62. For the production of white reserves under grounds padded with Indigosol Brown IBR an instruction sheet is available. It is stated that it is only possible to obtain pure white reserves by means of Reserve X. Directions are also given for making up a good reserve color.

• TEXTILE DRYING CONFERENCE

Drying of textile fibers, fabrics and other products that will preserve the natural properties of the fibers is to be the subject of an open conference to be held under the auspices of U. S. Institute for Textile Research at the Hotel Pennsylvania, Wednesday, May 6, starting at 10:30 A.M. All members of the industry, including manufacturers of drying machinery and control apparatus, are invited to attend and take part in the open discussion. The purpose of the meeting is to learn whether there is anything connected with the industry's drying problems which is likely to produce worthwhile results if subjected to scientific research.

Authorities on the drying of cotton, wool, rayon and other textile fibers and products will open the discussion, and present brief reviews of present drying methods, of existing scientific knowledge of efficient drying, and of damage due to improper drying. W. E. Emley, chairman of the Research Council of U. S. Institute and chief, Organic & Fibrous Materials Div., National Bureau of Standards, will preside.

This will be the fourth conference of this character that has been called by U. S. Institute; subjects previously considered having been wear testing of textiles, warp sizing and rayon crêping. Research on the last two subjects is in progress, that on rayon crêping under the joint auspices of the American Association of Textile Chemists and Colorists and the Throwsters Research Institute, and that on warp sizing by U. S. Institute. Because the wear testing of each class of textiles involves different problems no general research was undertaken; since then, however, wear testing studies have been conducted by carpet, hosiery and lining manufacturers.

The subject of drying has been on the Research Council's tentative list for some time. Disclosure by the warp sizing study of the wide variation in temperatures that are being used by different mills for the drying of sized warps caused the Council to place the subject on the active list at their recent meeting in Washington, D. C., and it needed but brief discussion to indicate that equally wide variations exist in practically all textile drying. Most mill men who have had much experience in drying have learned by that experience that textile fibers and materials may be seriously damaged when they are subjected to too high temperatures for too long a period. But there is no reasonably exact empirical or scientific data for critical drying temperatures expressed in terms of time, moisture content or regain of fibers, relative humidity and volume of circulated air, etc.

This very complicated problem is further complicated by its economic factors —drying production and costs; not only cost of drying, but cost of materials. Were there exact scientific knowledge of safe drying conditions within certain tolerances it might be possible to increase production limits now considered safe maximums, or they might have to be reduced. Drying damage to cheap cottons, that might not become apparent until the products were dyed and finished, is one thing; similar damage to rayons, silk, woolens or worsteds is a more serious financial matter. There are no statistics showing the annual losses in dollars and cents due to inefficient textile drying, but no statistics are needed to prove that the losses due to dyeing and finishing troubles, in yarn and fabric strength, and in the desired "hand" or feel of the finished fabrics, for which it is responsible are tremendous in number.

While the economic factors of the drying processes will not be overlooked at the coming conference, the discussion will be concerned primarily with drying that will preserve the natural properties of the textile fibers—conditioned drying. For further particulars, those interested in attending the conference themselves or having their representatives attend, are asked to address C. H. Clark, Sec., U. S. Institute for Textile Research, Inc., 65 Franklin St., Boston, Mass.

• APRIL TEXTILE RESEARCH

The April number of *Textile Research* contains two reports of Textile Foundation researches: one by R. L. Steinberger on "Creep in Cuprammonium Filaments," and another covering experimental growing, preparing and manufacturing domestic flax. The latter report has also been published in abstract form by the Foundation, and copies can be obtained by addressing E. T. Pickard, Sec., Commerce Bldg., Washington, D. C. Of this report *Textile Research* states "it provides for the first time a yardstick which may be used to evaluate machines, processes and methods that future promoters and inventors may claim will make domestic flax growing commercially successful."

Much basic information regarding sizing materials and the sizing of cotton warps, most of which is interpreted in non-scientific language, is contained in the paper by F. G. La Piana on "Sizing and Finishing of Textile Fabrics." This was originally presented at the recent meeting in Washington, D. C., of Committee D-13 of the American Society for Testing Materials.

In an article on "Improved Rapid Sectioning of Fibers" E. R. Schwarz describes and illustrates new technique that is in part an adaptation of former methods of his and others, and that may be used for both yarns and fibers.

The "Alkaline Degradation of Wool" is descriptive of experimental work conducted by Barr and Edgar of Iowa State College. Several reports of research on textile fiber degradation by Miss Edgar

and her associates have been published previously.

The issue also contains additional information regarding the new Italian casein wool, an announcement of a conference on drying problems to be held by U. S. Institute for Textile Research in New York City, May 6, and a reprint from the *American Dyestuff Reporter* of a recent editorial: "Who Backs Textile Research? Who Should?"

• TEXTILE HEALTH HAZARDS

A survey of the use of chemicals in the woolen and worsted mills of Massachusetts which might be injurious to health is being made by the Division of Occupational Hygiene in the Department of Labor and Industries of that State in co-operation with the Federal Works Progress Administration. The extent to which members of a selected list of chemicals are used will be determined; also any precautions that may be taken and any unfavorable experiences that have occurred.

Emphasis will be placed on the volatile solvents, used largely as tar removers and spotting agents. The work is planned to include air analyses in the vicinity of typical operations using these materials. In this way it is hoped that it will be possible to ascertain the conditions under which toxic substances may be safely used, and those for which the substitution of relatively non-harmful materials is desirable.

Each employer will receive a report in the findings in his establishment. It is planned to include a fair cross section of the woolen and worsted mills in the eastern and central portions of the State. Requests for studies in plants not included in the survey will gladly be complied with. Suggestions from mill operators will be welcome. Reports of definite experiences with chemicals relating to the health of employees are especially desired. Communications should be addressed to James T. Moriarty, Commissioner of Labor and Industries, 473 State House, Boston, Mass.

OPEN FORUM

Rules under which this department of the REPORTER is conducted are as follows:

1. Anyone who has a technical problem on which he would like advice may submit it to the Reporter and it will be published in the first available issue.

2. Any reader who feels that he has a solution of the problem may forward his reply to us and if we feel that the reply is suitable it will be published in a succeeding issue.

3. For each such reply published the Reporter will pay a minimum of $2.

4. In case there is more than one answer to the same question, the one covering the subject in the most complete and authentic manner will be published, or if two answers are sufficiently different both will be published. If two answers are considered equally good, the one first received will be given priority.

5. The Reporter will assume no responsibility whatsoever for the accuracy of the answers submitted—it is simply offering a vehicle for the public expression of its readers' opinions.

6. Both the questioner and answerer must send in his complete name and address. When requested we will publish only the initials or other identifying insignia.

Answers

35—I would appreciate information as to analytical methods of testing minute spots of iron rust on undyed cloth.—**G. L.**

Answer:— A very satisfactory method of identifying spots on undyed cloth as iron compounds is to add a drop of potassium ferrocyanide and dilute hydrochloric acid to the suspected spots. If the spots turn a dark blue, iron is present. Sometimes the spot is due, not to rust or iron oxide, but to small particles of iron itself; it is better therefore to just add a small drop of dilute nitric acid before adding the potassium ferrocyanide.

In a great many cases, the rust or iron is associated with oil, in which case a preliminary removal of the oil with gasoline or carbon tetrachloride will cause the blue color to develop more quickly and more intensely. —J. H. Skinkle.

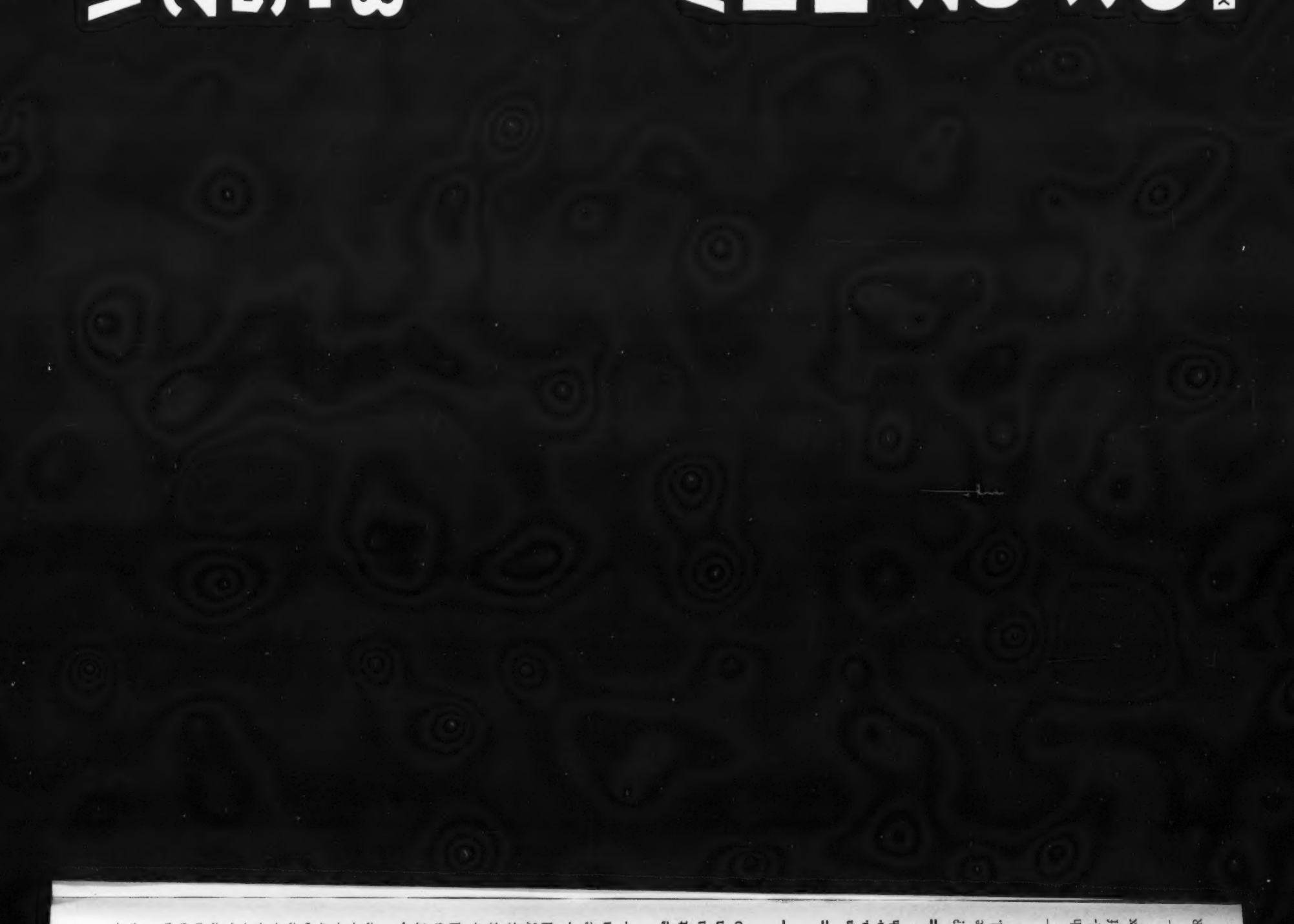
32—I am experiencing some difficulty with knitting yarns in that they are harsh after dyeing to such an extent that they do not possess the necessary spring or elasticity to permit them to knit the same width as the natural grey yarn. In other words, material knitted from the dyed yarn under apparently the same conditions, comes from the machine wider than that knit from grey yarn. It is further a fact that I find that dyed and bleached yarn spreads out in the knitting machine as compared with that which is unbleached and which has not been specially treated in any way.

How can this be overcome? Should it best be done through the use of softeners, or, through modification of the bleaching and dyeing process? Any suggestions will be appreciated.—**W. P. B.**

Answer:— Replying to question 32, I wish to state that after dyeing, care should be taken as to the amount of scroop on knitted yarns. A good olive oil emulsion will help. Tartaric acid is a good staple scroop when used in the right proportion. An over-bleach, or too strong a bleach, will make the yarn harsh.—T. S.

CLASSIFIED

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED: Have you a pH problem? Chemist, experienced in the application of pH to dye problems, available June 1st. Correspondence invited. Write Box No. 897, American Dyestuff Reporter.

POSITION WANTED: Organic Chemistry research assistant or laboratory control work. B.S. degree. Knowledge of German. Excellent references. Remuneration of secondary importance. Will go anywhere. Write Box 898, American Dyestuff Reporter.